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PREPARATORY MACHINERY.

We devote the larger part of this issue to descriptions and illustrations of machinery and devices used in the processes of cotton manufacture preparatory to those of spinning. These include the mixing, opening, scutching, carding, drawing and roving of cotton, as well as those of combing and auxiliary operations. We have confined ourselves to such machinery as may be found in American mills whether of domestic or foreign make. Readers will be able to make comparisons between the mechanical contrivances and expedients employed by different makers of machines that are intended to accomplish the same object in manufacture with the utmost economy.

Great advances have been made within the last sixty years, which may be accepted as the period of modern cotton manufacturing, when factory operations have become systematized into a consistent unit wherein machinery has superseded manual labor in a continuous process according to methods familiar to mill practice of to-day. The principal machines that unified the modern factory system of manufacture between 1840 and 1850, were the loom and the mule that were sufficiently elaborated in their parts as to make them automatic in all of their essential functions. This was also the time when the combing of cotton by automatic mechanism, as we see it to-day, came into existence as an invention that has had a wonderful effect on the cotton manufacturing industry by elevating it into a sphere of exquisite refinement.

THE SELF-STRIPPING CARD.

The revolving flat-card as we know it to-day, was conceived of in the 50's though it took thirty years before improvements made it an acceptable machine enough to establish its pre-eminence in the estimation of manufacturers, especially those of this country. In the meantime there was invented and quickly adopted the self-stripping card that was successfully brought into use in 1857, though patented three years previously, almost simultaneously by George Wellman of Lowell, Mass., and Horace Woodman, of Biddeford, Maine. What these inventions practically accomplished was of immense value to cotton manufacturing during their reign or till the appearance of the revolving flat-card in its improved form. They did what inventors had been striving for years before, that of cleansing the "top flats," that surmounted the main carding cylinder, from accumulated waste by some automatic means without limiting the productive capacity of the machine. Besides, and of equal importance, they saved much manual labor in the card room. The Wellman and Woodman patents were consolidated in 1867, after much litigation over questions of interference, though both were modified more or less by improvements before and after this date. This method of stripping card flats was better known as the Wellman than the Woodman, in fact the latter name was seldom used. Prior to 1890, or the last decade of the 19th century, and subsequent to 1850, nothing impressed itself so materially and so vitally upon the progress made in the preparatory processes of cotton manufacturing as these automatic devices for cleansing the carding machine regularly and sys-

tematically and dispensing with labor. Some of these machines are still to be found in our factories, but they are going into disuse and are now regarded very much as relics of a system that was once in high favor but now being relegated to the realm of an honored memory.

THE REVOLVING FLAT CARD.

The only style of carding machine now installed in a cotton factory is the one whose top carding surfaces revolve above the main cylinder at a uniform speed and presenting at all times the same carding area. The originator of this card was Evan Leigh of England, and though many years were required to perfect it and secure for it the endorsement or acceptance of manufacturers, it has now established for itself the supreme position of being the only machine that should be utilized in a cotton factory except such, it may be, as is for waste or very low-grade stock for special purposes. This machine is at the acme of what inventive genius has yet attained. For this reason, the illustrated articles relating to it to be found elsewhere in this issue will be read with interest as furnishing comparative information of the best mechanism in vogue for the carding of cotton. While the principle is the same in all the machines they differ in some of the devices employed for availability of purpose. These different devices may be profitably studied and compared. In some particulars we have given special stress to these, and have given preference to sectional rather than to perspective views as better or more clearly exhibiting the working functions of what may be described.

THE COMBING MACHINE.

The combing machine is co-ordinate with the carding machine but is employed for a more refined product in quality, if not always in the size of the spun yarn. This machine is a recent innovation in the manufacture of cotton, on anything like an extensive scale, though invented more than sixty years ago. Its advent has been due to an increased demand for a higher quality of manufacture, made possible by the better financial circumstances of the people throughout the civilized world. The inspiration of all cotton combing machines has been derived from the inventions of Heilmann that first attracted the attention of manufacturers at the London world's exposition in 1851. This pioneer machine is one of the most remarkable inventions that has impressed its importance on the textile arts, as holding true to its original ideas. Its advent marked a beginning of the utmost significance at a period that was epochal in the history of the textile industry. In modified forms it has been adapted to the working of ordinary lengths of staple which previously had to be that procured from the sea-island and Egyptian varieties of cotton. It is encroaching upon the domain of the card in some respects where purification of product is a desideratum of importance.

THE ROVING FRAME.

One of the most interesting machines to study in the factory is the roving frame, that has attached to it specific names not uniformly applied by builders, according to the functions it is intended to perform. We have devoted considerable space in our illustrated articles to this piece of mechanism, upon the proper working of which largely depends the success of the spinning operations. As the most vital feature of this frame is the differential motion, also designated as the "compound motion," "equation box," "differential box," etc., we have given it prominence in the descriptions and illustrations of some of the leading makes for accomplishing the same purpose. This motion was invented by Aza Arnold of Rhode Island and patented in 1823, and again patented in England in 1826 by Henry Houldsworth, Jr., under circumstances that appeared to be somewhat surreptitious. Abroad, this motion is known as the Houldsworth, and to this extent Arnold has been robbed of the credit that is due him, who declared that the object of his inventing the differential device was to do away with the intricate construction of the machine, and to simplify and extend its use, "so that one set of gears can be adjusted to each and every size of roping by merely changing the pinions." This motion, in all of its essential features, has been retained in the roving frames made by the oldest and one of our principal machine shops, as will be noticed elsewhere in this issue. The compound or differential gearing that is universally a part of all roving frames vary in form in the machines of different builders, as may be noted in the examples that we have the satisfaction of showing.

THE RAILWAY HEAD.

We have not thought it necessary or convenient to show in connection with other preparatory machinery the "railway head" that held an important position for many years in American processes of cotton manufacturing, because of its general disuse, or, it may be said, present obsoleteness. It is scarcely known by the generation of manufacturers that is now coming into the theatre of action. It is another relic of fame once earned but now almost forgotten. Its glory was always a doubtful equation, as opinions of its functions in their effect upon the cotton staple varied very materially, and many learned dissertations were presented to cotton manufacturers' meetings upon its province as an adjunct to the carding process and to what extent its operations were deleterious to the fiber. It seemed to be the consensus of opinions as the result of various investigations that more injury to the fiber was done by the heavily weighted draft rolls of this machine than by any other, the drawing frame standing next. The railway head kept its hold upon the carding process till the revolving flat card superseded the stationary flat card. Its career was a long one of considerably more than a half century, being particularly favored by American mills, the English mills not taking kindly to it, though in Scotland it had its advocates as it is recorded that Niel Snodgrass of Glasgow put it in operation in 1835 with eight cards delivering into one head, with the advantage that the labor of several hands was saved.

PRELIMINARY MACHINES.

Improvements in the picking or scutching machinery and in the methods of manipulating the stock from one operation to another have characterized the preliminary processes of those under discussion as vitally as may be seen elsewhere. As now arranged, there is little carrying of cotton by hand except in compact form, all opening and conveying being done by mechanical devices that not only save the cost of labor but present the cotton in better condition to the next process than it is possible to do by any manual agency. The bale breaker is going out of date, but we have alluded to it on another page so as to give our scheme more of a measure of consistency, as this machine still has a lingering existence in the equipment of some mills. The hopper, bale breaker is taking its place. We believe it will be admitted that the improvements made in the picking department of a factory have been as important as any which have been made elsewhere.

THE PLANTER AND THE SPINNER.

Notwithstanding the present favorable outlook for a large yield of American cotton, it is too soon to prognosticate with certainty that prospects will fructify to the full extent of what may be reasonably anticipated. There is time yet before the final harvest for a great deterioration in the yield and quality of the crop. However, assuming that nothing extraordinary will happen in this respect, and that the remainder of this season will be similar to the average of former seasons with like previous conditions affecting the growth of the plant, it is rational to expect a large production equal at least, to anything ever before realized. It would not be at all surprising if a yield of 14,000,000 bales was the record and of excellent spinning quality and good grade. Under ordinary or normal conditions affecting manufacturing in this country and abroad, —for the commercial world is sensitive to what occurs in all of its parts,—this production would be needed far more than in the season of 1904-05 when the crop reached nearly 13,500,000 bales, and at a remunerative price to the farmer. Unfortunately a large or even normal aggregate consumption for the current cotton year is far from promising, though we expect to witness the usual activity among mills during the latter half of this period.

The price of the staple is a matter about which it is unsafe to predict, but we believe that it will not go below ten cents a pound for the middling upland grade in the New York market. Although the laws of supply and demand eventually determine the market price of every commodity, the situation can be largely regulated by the farmers, individually and through their organizations, by their not marketing their holdings only as there is a call for them for immediate consumption, as near as this can be ascertained from trade reports. When this call comes it is generally good business judgment to sell at what the product will bring, and not attempt to establish artificial values in expectation of their realization. This latter procedure is nothing less than pure speculation, which we believe, is outside the province of the farming class or their representatives. In order to carry out any holding scheme on the part of cotton planters, the establishment of warehouses with arrangements that shall be substantial and reliable for financing the property in store, is the best plan that has yet been presented and which is being carried out as expeditiously as seems feasible.

It is of no advantage to spinners to secure their cotton at a price that will not yield the farmer a fair profit for his commodity, as they thus lessen for their manufactures the purchasing power of a willing customer. Spinners, generally, thoroughly comprehend this position, and are disposed to pay a price that is remunerative to the planter if permitted to do so by the state of the trade for their own products. However, whatever may be the disposition of spinners it can not be expected they will act otherwise than to purchase their raw material at the very lowest figure possible, simply and no more than having the satisfaction of obtaining it at a cost not in excess of that to any of their competitors. Spinners, therefore, always stand in the light of being bears, but no more so than any other class of buyers, for a legitimate and not a speculative purpose. Any farmer with any conception of business knows the position of spinners as well as we do, but on the other hand, as a seller, he has his own interests to consider that are more or less contrary though not necessarily inimical to those of the buyer. His inclinations and efforts are to get all he possibly can for his cotton, but this he can not do if he does not conform to good business practice of parting with his property to a legitimate purchaser to meet the legitimate requirements of consumption. This good business practice can be made more available and effective by acting in concert with others having like interests through a representative organization that is efficiently officered, and for this reason it is conducive to better trade relations for the regulation of prices and for the more uniform distribution of the cotton crop to have a strong central union of farmers, as is now presumptively the case.

The efficiency, as a business body, of a farmers' union depends absolutely on the character and ability of those invested with authority, who have broad and correct ideas of the laws of trade so as to be able to advise wisely, and, moreover, who will not attempt to misrepresent crop conditions, about which they should be familiar, for a temporary gain, as was exemplified last year in giving the statistical position of the yield of a State at less than was clearly evident at the time, and for which gross error of half a million bales an excuse was vouchsafed after the actual crop became known, that the estimate was only for the upland growth, and for the only growth that farmers ever consider in their crop estimates, and this at an average of 500 pounds to the bale. The sea-island crop and linters were eliminated in the mad effort to find some justification for trying to hoodwink the trade into thinking that the yield was very small and that prices must in consequence go up. Such matters are remembered and militate against the organization or its officials that perpetrate their falsity.

SHUTTLE AND BOBBIN WOOD.

There has been persistently stated in the press from the Atlantic to the Pacific States that the supply of dogwood and persimmon trees in the South is nearly exhausted. This information seems to have originated in a report of the United States Forestry Bureau, and, of course, has received general credence, but, unfortunately, it has also acquired accretions in its travels not germane to its original intent.

We are now told that as "the entire supply of shuttles, bobbins and spindles" used in the cotton and woolen mills in all parts of the country is furnished by the dogwood and persimmon growing in the Southern States, "the seriousness of the situation is apparent." But, we are also informed that the shuttle manufacturers have found another source of supply in the dogwood stands in the far northwest part of the country. Two large companies manufacturing spindles, shuttles and bobbins have erected plants in the Cascades in Oregon, whose dogwood forests are the greatest in the world, the tree often attaining a height of seventy-five feet and a diameter of one to two feet. But it is said that the adaptability of the Pacific dogwood has not aided the Eastern manufacturers, and they have been obliged to look for substitutes nearer home, the most promising of which are mesquite and tupelo gum. The wood of the mesquite is heavy and very hard, close grained and has a compact structure and is thought to be eminently adapted for the manufacture of shuttle blocks, as it appears to have all the requisite qualities of weight, hardness and susceptibility to a high, smooth polish. It is stated to be well

fitted for the manufacture of spools and bobbins for which white birch is now so largely used. The tupelo gum is medium hard and heavy, and has a compact fibrous structure. It has not yet been utilized to much extent in the textile industries, though it may play an important part in the future, since it combines with several necessary qualities the exacting property of wearing smooth by friction.

As a matter of fact, the bobbin and shuttle factories of the United States are experiencing no trouble in securing a sufficient supply of dogwood and persimmon wood for all of their requirements, as we learn from direct communication with them, and if the supply of these woods is nearly exhausted, it is not apparent. It may be the supply is becoming more scarce near railway facilities of transportation, but there are fairly good quantities at points somewhat remote from these, and especially is this the case with persimmon, which appears to be abundant. These two kinds of wood are used almost exclusively in the manufacture of shuttles, for which there is probably nothing better. The relative value of the Pacific coast dogwood for the making of shuttles is but little known by our Eastern manufacturers, but those who have tried it declare it to be of inferior quality, as its grain is not as dense and fine as the smaller growth of the South.

In regard to the suggested substitutes of mesquite and tupelo gum for dogwood and persimmon, there is nothing to be said, as they have not been given a trial either experimentally or continuously under ordinary mill conditions. There is no information to be obtained of their supply, whether it is sufficient for requirements or not. Black gum has been recommended as a substitute, but it has been found that it will not hold its shape, no matter how dry it may be, as it will twist with the variations of the weather. This defect is one of the things which has to be guarded against in selecting timber for shuttles. Timber may be very promising in appearance but have this objection.

Bobbins are not made from either dogwood or persimmon to any extent. The highest grade of bobbins is made from birch and maple that grow in the northern part of New England.

AMERICAN COTTON MANUFACTURERS' ASSOCIATION.

PROTEST AGAINST INCREASE OF FREIGHT RATES. FURTHER CURTAILMENT OF PRODUCTION RECOMMENDED. NEXT CONVENTION IN NEW YORK.

At the special meeting of the board of governors of the American Cotton Manufacturers' Association, held in Atlantic City, N. J., August 1, it was decided that the next annual convention would be held in New York City in May, 1909.

The board adopted the following resolutions: "Resolved, That the board of governors of the American Cotton Manufacturers' Association, protest against the proposed increase in freight rates as unnecessary and most inopportune, adding to the burdens of dry goods distributors and increased cost of transit of merchandise between farmers, manufacturers and retailers, and generally impeding trade developments.

"It is the sense of the board of governors that the present condition of extraordinary depression in the goods market is due to accumulated stocks and production in excess of demand. The remedy for this depression is further curtailment and it is better that this curtailment should be done immediately, because immediate action would bring normal prices quicker and cotton mill workers would find it easier to live in summer than in winter."

It was found on a canvass of the board that the majority of the board are already running from two-thirds to one-half time, and some not at all. The board of governors recommends that all mills reduce their running to half time or less during August and September or until profitable prices can be obtained. It was ascertained that some mills have shut down entirely and in order to hold their operatives are paying them for half time and furnishing houses free of rent, rather than take present losses or accumulate goods under present conditions.

Investigation convinced those present that there was a great many more goods and yarns in the hands of mills, commission merchants and converters than had been anticipated.

STANDARDIZING GRADES OF COTTON.

The following memorial to congress was passed at the last session of the Louisiana Legislature. State Representative Leon Smith of Caddo Parish, who offered it fought strongly against the anti-future law that was up for passage and was largely instrumental in defeating it. The memorial shows how sentiment in the South is crystalizing among opponents of anti-future laws. A great many prominent members of the Southern Cotton Association and the Farmers' Union are said to indorse it. Similar memorials, we hear, will be offered at the next Legislature of Arkansas, Texas and Mississippi.

Be it resolved by the house of representatives of the State of Louisiana, the senate concurring, that our senators and representatives in congress be and they are hereby memoralized to urge congress to enact a law establishing a national standard of classification of the marketable grades of cotton, upon which standard all arbitrations on contract deliveries must be made; prohibiting any contract on which can be delivered unmarketable cotton or useless stuff, or cotton of a value uncertain and not readily ascertainable; and, providing that all cotton delivered on contract shall be paid for on the basis of actual differences in the spot value of the grades delivered on the market and at the time of delivery. Be it further resolved, that a copy of these resolution be sent by the secretary of state to the several senators and congressmen from the State of Louisiana in the congress of the United States.

COTTON MANUFACTURERS AT SARATOGA SPRINGS.

The National Association of Cotton Manufacturers will hold its annual fall meeting at Saratoga Springs, N. Y., on September 29 and 30.

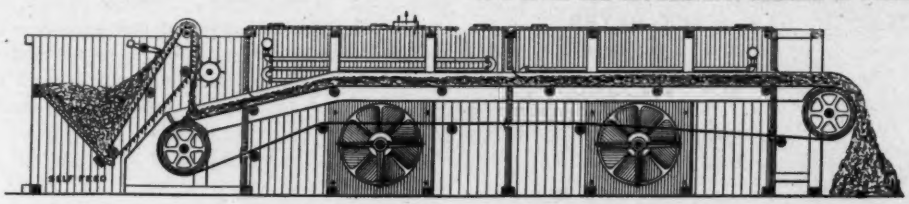
The preparation by combing of cotton for mercerisation has a considerable influence on the subsequent luster of the yarn. Sea Island cotton posseses a rather silky fiber to begin with, and this is made more adaptable to the production of a high luster by combing, in which operation the fibers are arranged parallel, and still further by gassing, which burns off the minute outer hairs.

PREPARATORY COTTON MACHINERY
FROM THE BALE TO THE SPINNING

DRYING MACHINERY.

The accompanying illustration shows a sectional view of a "Hurricane" automatic dryer for cotton and wool stock.

In this machine the stock is placed in the automatic feed hopper, which delivers it in a uniform layer to the main conveying apron of the dryer. In some of the older drying systems frequent objection was raised on account of the harsh feeling imparted to the material, resulting from high temperature and lack of circulation. This dryer is so arranged, however, that the temperature is graded as the stock advances toward the delivery end of the machine. As it passes along on the conveyor, large volumes of air are circulated first over the steam coils and then through the stock, and when it reaches the further end of the dryer it is delivered cool and dry and in a first-class condition for handling.



AUTOMATIC COTTON STOCK DRYER. SECTIONAL VIEW.
The Philadelphia Drying Machinery Co., Philadelphia.

The air is circulated by means of large steel blade fans, which are designed to do the greatest amount of drying with the least possible consumption of power.

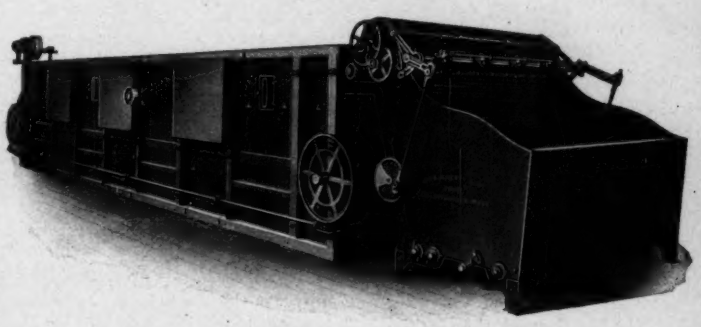
The dryer is very compact and requires but a comparitively small amount of floor space. Fans of large diameter are used, and on account of the tremendous air movement thus secured, much less steam is required than in the older drying system. This machine is thoroughly automatic in its action, it being necessary only to place the stock in the hopper of the automatic feed, and remove it from the delivery end of the dryer.

The fire insurance companies have been very particular within recent years to have improvements introduced that would tend to lessen the fire risk in drying machinery. To satisfy this demand, the manufacturers of the present dryer are now constructing their machines entirely of steel and iron,—the framework being of steel angles and the panels of sheet steel. The dryers are also constructed with all fan shaft bearings outside of the drying enclosure and away from the heat. This steel and iron construction not only makes the machine fire proof, but also renders it very much stronger and more durable.

COTTON STOCK DRYER.

The drying machine described herein is used extensively among the cotton mills of the country who dye or bleach in the stock. The stock to be dried is taken from the dyeing machine or bleaching tank, and after being run through the hydro-extractor or press roll machine is placed directly into the hopper of the automatic feed connected to the dryer. This automatic feed serves as an opener and separates the fiber matted by the action of the dye liquor and dyeing machine. It combs it out and deposits it in an even layer on the traveling apron, thereby allowing the heated air to more evenly penetrate and consequently more uniformly dry it.

The dryer consists of a long chamber through which a vertical partition runs laterally. One side of this partition, called the coil-box, contains the steam pipe; and the other, called the drying chamber, holds the traveling apron which supports the cotton while being conveyed from one end of the chamber to the other. It is built in various lengths called sections, each of which is fifteen feet long. Transverse partitions separate the coil-boxes at each section. The heated air is alternately circulated through the stock and coils by fans located in the partition between the coil-box and the drying chamber. Each section contains two fans, although the dryer is frequently built with a half section, or a seven and one-half foot addition in which there is but one fan. The fans are placed in openings in the partition, are mounted on horizontal shafts, and blow air into the drying chamber, through an opening in the partition at the top and extending the entire length. The coil-box sections, therefore, have no direct connections, except by the drying chamber. Circulation of the air is as follows: Fresh air is taken in at the doffer end of the machine, it passes



FEED END VIEW OF A ONE-APRON DRYER.
C. G. Sargent's Sons, Graniteville, Massachusetts

through the fans in the last section and is blown upward through the steam pipe in this section through the opening at top of partition, downward through the stock on the traveling apron. Some of this air is again seized by the same fans and re-circulated in the manner explained above, a portion, however, passes to the fans of the next section, which in their turn force it up through the coil of pipe in that section, through the opening in top of partition, downward through the stock again. Some of this air is re-circulated in this section, while a portion passes forward to

the fans of the next section, and so on until it arrives at a point near the feed end, where it is exhausted.

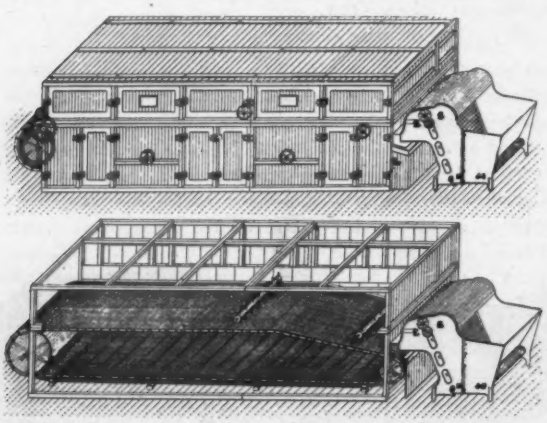
The air passes downward through the stock, upward through the coils and continually travels in the path of a spiral towards the feed end in the opposite direction to that of the stock. It is therefore constantly passing through stock containing greater moisture to a point of discharge.

There is, however, an additional current provided by the conduits or by-passes (see illustration). These by-passes are located on the outside of the drying chambers opposite the fans, and have two openings, one above and one below the stock. Some of the air blown by the fans passes across the drying chamber over the stock, through the by-passes where it is sucked by the fans under the stock. Three directions of air currents are therefore available. Over the stock, under the stock, and through the stock.

While the cotton is passing through the drying chamber, it is acted upon by "kickers." These kickers consist of two rows of round wooden teeth held in a lag and securely mounted upon a shaft.

AUTOMATIC RAW STOCK DRYER.

The accompanying illustrations show two-section single apron dryer, with automatic feeder. The frame is made from hardwood stock, mortised and joint-bolted together, then covered with kiln-dried sheathing and lined throughout with best roofing tin. Everything inside the machine is metal, as well as the automatic feeder outside, which is of heavy iron construction and suitably built for handling wet



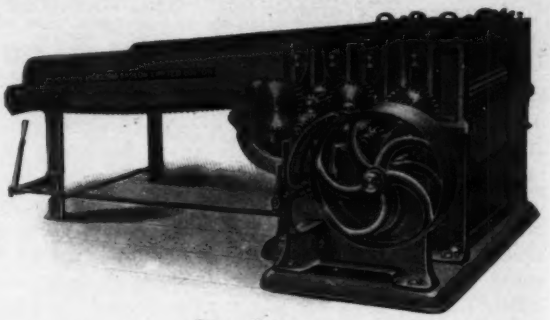
COTTON DRYER.

Kitson Machine Shop, Lowell, Massachusetts.

stock. This has iron drums and long-link steel chains to do the work, while a specially woven apron or endless belt of tinned wire 72" wide supports the stock being conveyed through the machine. This combination of chain and apron is peculiar to this dryer only, and is regarded as a highly important feature of a successful conveyor of stock. In the compartment back of the apron are two steam coils, fitted for either live or exhaust steam, and containing about 2,700 feet of 1¼" steel pipe and fittings. Two 48" steel fans, running in self-oiling boxes, keep a constant circulation of air from steam coils passing down through stock being conveyed through the machine. Two whippers running in close proximity to the top of the apron keep the stock loosened up, insuring perfect drying.

BALE BREAKER.

The object of the machine here shown is to loosen the hard, lumpy, compressed portions of cotton, and to free it as much as possible from all the heavy impurities before passing it through the opening machine. It also relieves the opener from unnecessary strain and prevents breakdowns.

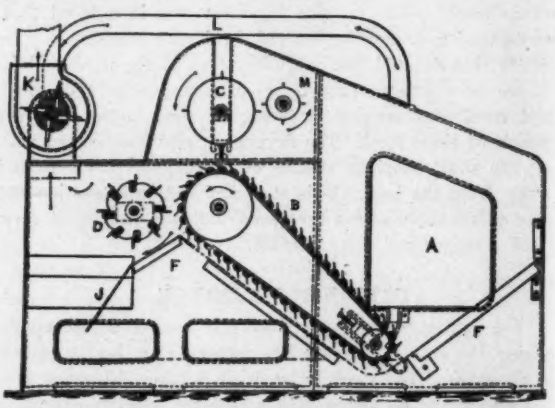


BALE BREAKER.

The machine is made two feet, eight inches wide, with four pairs of differentially speeded rollers weighted by strong spiral springs; the first pair of rollers and the top rollers of the second and third pairs are made in sections with strong teeth, so that if any of the teeth of a particular section get broken that section can be removed and replaced without renewing the whole of the roller—the bottom rollers of the second and third pairs and the fourth pair of rollers are all coarse fluted. The toothed rollers are arranged to give any extent of draft that may be required for the different classes of cotton to be worked, so as to obtain the best features of hand pulling. Fair and good American, Egyptian and sea island cotton are worked on this machine. The hopper bale breaker is rapidly superseding this machine.

HOPPER BALE BREAKER.

This machine is made in two widths, 36-inch and 48-inch, according to production required. The 48-inch machine will open a full-sized bale of Egyptian cotton in from three to five minutes, and an American bale in from six to ten minutes. The narrow machine, although producing less, is sufficient for the requirements of most mills.



SECTION OF HOPPER BALE BREAKER.

Dobson & Barlow, Represented by Stoddard, Haserick, Richards & Co., Boston Massachusetts.

A. Cotton Chamber, B. Spiked Lattice, C. Improved Evener Roller, D. Stripper Roller, F. Dust Bars, J. Cotton Guide Plates, K. Dust Fan, L. Dust Pipe from Cotton Chamber, M. Evener Roller Stripper.

The object of this machine is to prevent irregularity of feed, and the moving parts of this machine are more that of combing the fibers of the cotton than of tearing them, which latter it is always desirable should be avoided.

The cotton is fed direct to the machine down longitudinal dust bars (which allow much of the heavier impurities to fall away from the cotton through the bar spaces) to the spiked lattice, or the cotton may be fed to the spiked lattice by means of a bottom feed lattice 4 feet 6 inches long.

The evener roller is placed on the top of the spiked lattice in a vertical line, and the distance from the point of the teeth on the evener roller to the point of the teeth on the spiked lattice can be easily adjusted by an adjusting screw and lock nut. This roller has four rows of hardened steel teeth. A clearer roller with four rigid leather strips is applied to keep the evener roller free from cotton.

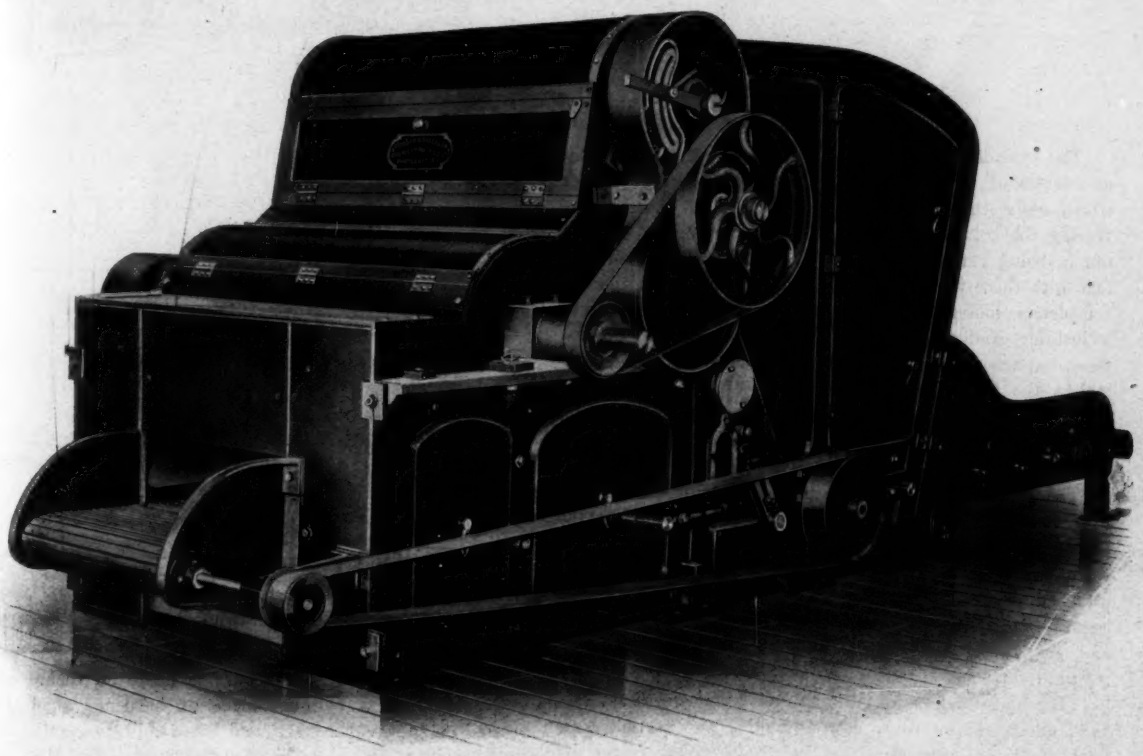
The cotton is stripped from the spiked lattice by a cylinder with eight rigid leather strips, and passed forward over another set of longitudinal dust bars (which also help to further clean the cotton), and then passed forward to either elevating lattice—by means of a short delivery lattice—or through the floor to the mixing lattice as may be required.

HOPPER BALE OPENER.

This machine is extensively used in England and on the continent, where it is giving very satisfactory results. Its object is to thoroughly open cotton without damage to the staple preparatory to making mixings or being fed to the openers which follow.

Its productive capacity is very great. A bale of cotton can be put through in six to ten minutes, or 150,000 to 200,000 pounds per week. The machine is made with different kinds of feed and delivery arrangements. Generally a short feeding lattice is applied as shown in the illustration. Sometimes a much longer lattice is used, from either side of which cotton can be taken from as many different bales as desired, ensuring thorough and even mixing. Waste can be evenly mixed with the cotton in any desired proportion. Owing to the thorough mixing, the variously shaded colors of different cottons are no longer traceable in either yarn or cloth.

The delivery as shown is intended to drop the cotton on the floor or into a mouthpiece of a conveying system. Other arrangements are made by which the cotton is carried upwards from the machine either by pipes or traveling lattices by means of which the cotton can be delivered at any desired point.



HOPPER BALE OPENER.
Howard & Bullough, Pawtucket, R. I.

A fan is placed on top of the machine and a pair of pipes are applied, so that the dust is drawn from each end of the machine. The stripping roller is used as the driving part of the machine, and runs from 450 to 500 revolutions per minute. This machine can be coupled direct to the hopper feeder of an opener if required.

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The maximum weight of sliver from the revolving flat card, consistent with good quality of work on medium and low numbers, is sixty grains per yard. For many special classes of work this is too heavy. One rule, however, holds good for all classes of work, which is: The more rapidly the work can be got from the card consistent with the quality or grade of work required, the stronger will be the yarn.

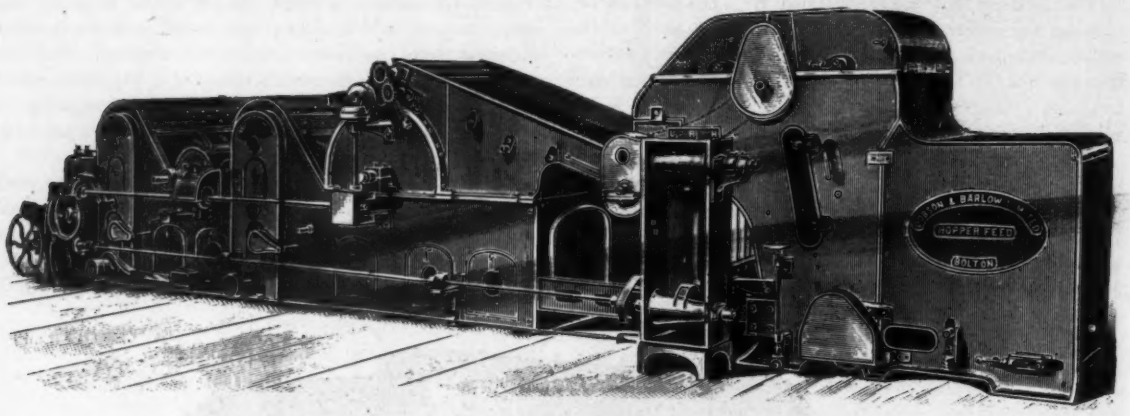
DOUBLE COTTON OPENER.

The accompanying illustration of a cotton opener with an automatic hopper feeder is the manufacture of one of the best known machine shops in England.

The cotton is carried upward by the cylinder, and is so effectively manipulated in its passage through the machine that it is entirely cleaned and freed from seed, leaf, dirt, sand and all other impurities. The laps are taken direct to the finishing scutcher, thus dispensing with the cost of a breaking or intermediate scutcher.

EXHAUST OPENER.

The machine shown in the accompanying illustration is a horizontal exhaust opener combined with a single scutcher and lap machine and porcupine opener feeder. The machine consists of an exhaust fan and two porcupine cylinders which are so arranged as to give a free and easy passage to the cages, the cotton being spread on the latter in a very even manner. The machine is provided with two sets of cages with a dust fan to each set, cylinder bars, two sets of dust bars and dust chambers, two or three bladed heater, 16 inches in diameter, and lap machine.



DOUBLE COTTON OPENER.
Dobson & Barlow, Represented by Stoddard, Haserick, Richards & Co., Boston, Mass.

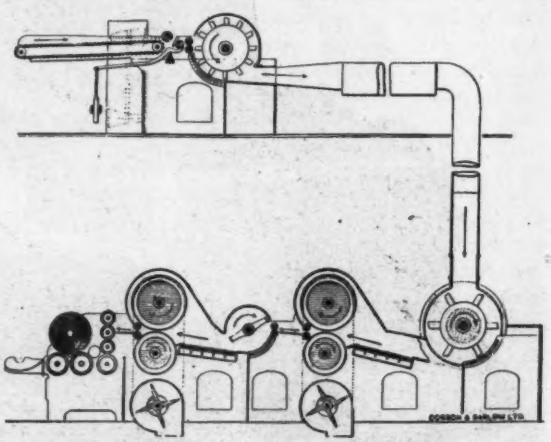
The cylinder cover plates are made of strong iron, the undersides of which have strong conical tooth projections which assist the cylinder very materially in opening and freeing the cotton from all extraneous matter, as the cotton in being carried around by the cylinder comes in contact with these tooth plates and the heavier impurities are completely loosened and discharged through a series of adjustable graduated grate bars, arranged so as to prevent these impurities from being drawn in with the cleaned cotton by the fan draught.

Attached to the machine are improved dust cages and dampers to regulate the amount of air to be passed through the cages.

The cylinder tooth plates are made with chilled cast iron teeth. The beater has hardened steel blades, the blades are planed on both edges so that when one edge is worn the beater can be reversed, and a safety motion is attached to the beater covers—by means of this the beater covers can only be raised when the machine is stopped, and the beater bars can be regulated and set to any required distance.

The machine has longitudinal or transverse dust box bars, and fans for up or down draught, also vertical cone feed regulator with large size horizontal cones driven by gearing, and a pedal motion to cylinder feed rollers with four anti-friction bowls between each pedal pendant to reduce the friction of the bowls to a minimum, thereby securing a free and easy motion to the pedal pendants.

The lap end is made from new designs to ensure the smooth working of the various parts with two or four consolidated calender rollers, driven direct from the beater; preventing any irregularity in speed between the calender rollers and feed rollers. There is also a clearer to prevent the cotton lapping upon the calender rollers.



HORIZONTAL EXHAUST OPENER.
Dobson & Barlow, Represented by Stoddard, Haserick, Richards & Co., Boston, Mass.

The porcupine opener feeder is made 36 inches wide and consists of a cylinder made of hardened steel teeth riveted on to circular rings, and has a collecting roller, one fluted pedal roller, one pair of fluted feed rollers, dust bars and dust chamber. There is applied to this feeder a vertical cone feed regulator with large size horizontal cones driven by gearing and a pedal motion with four anti-friction bowls between each pedal pendant to reduce the friction against the pedal pendants to a minimum.

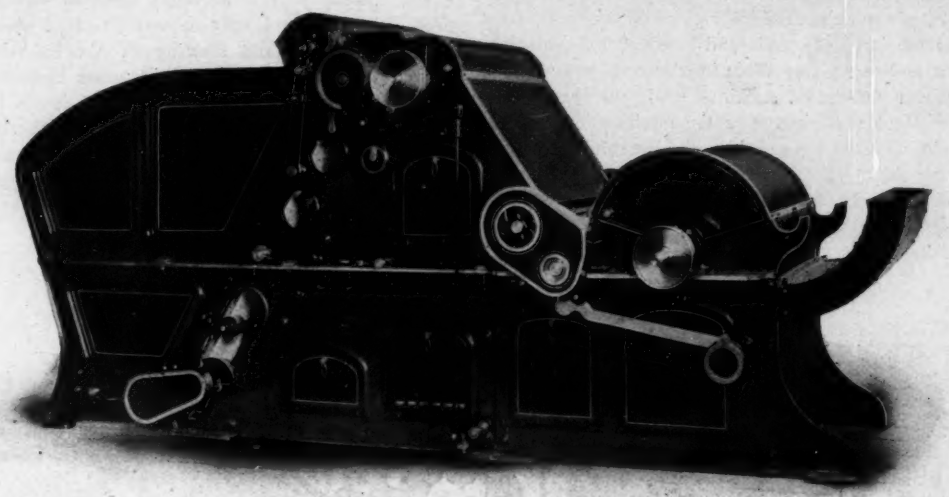
The porcupine feeder can be placed at any distance from the exhaust opener as desired, or in the mixing room above or below, and is connected with the latter by means of wrought iron tubing and dust trunks. The connection between the feeder and opener is arranged so that the feed

rollers in the former are automatically taken out of gear when a lap is completed.

The driving arrangement of the two machines is such as to prevent any irregularity in speed between the feed rollers of the feeder and the calender rollers of the opener.

COMBINED SELF FEEDER AND OPENER.

The machine here shown is a combination of an automatic feeder with an opener. This automatic feeder is simple in construction, strong and efficient. It can be attached to any make of opener or lapper. It has an extra large hopper holding 400 to 450 pounds of cotton. The spiked apron runs over large flanged driving pulleys. The pulley of the feeder when it is combined with an opener is driven from the cylinder or beater shaft, and when feeding on to the apron of a lapper is driven from the lapper counter shaft.



COMBINED SELF FEEDER AND OPENER.
Howard & Bullough, Pawtucket, R. I.

The opener may be provided with a two-blade or three-blade rigid beater, 18 inches in diameter, or with a 30-inch diameter special beater or cylinder. This special beater is designed to give better opening and greater production with less injury to the staple. Its action thoroughly opens the cotton and allows all seed, leaf and heavy matter to pass through the grid bars. It is made from steel boiler plates with steel fingers riveted on. The fingers are so arranged that in one revolution of the beater they cover the entire surface of the feed rolls.

GRID WITH COMB.

The more thoroughly the cotton from the bale is loosened, the more dirt is liberated from the cotton; and the more bars the grid is composed of, the more fine dirt is thrown out.

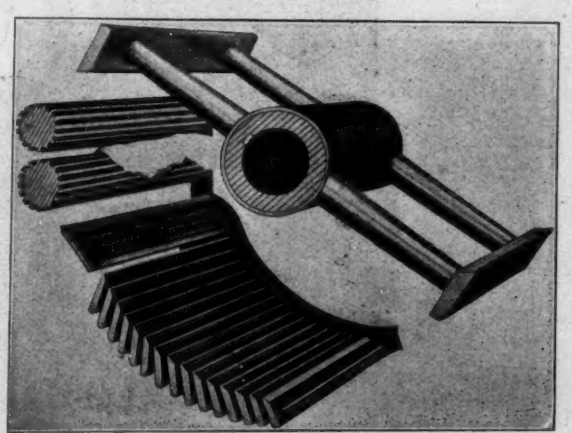
In view of these facts, a grid, as here illustrated, has been introduced with a comb, followed by more and thinner bars than have been employed before. The comb, with four rows of steel pins, is made in three grades, the coarsest and strongest for openers, a medium grade for breakers and intermediates, and the finest for finishers.

As the cotton is freely suspended in the air when struck by the beater against the pins, and is pulled down between the pins merely by the air current following the beater blades, the action is very mild and without injury to the staple. Even where used for the finest staple, this grid has never caused more waste on combers, nor caused any weakening of the yarn.

The bars are of rolled steel, perfectly straight, and the number of bars employed varies with the diameters of beaters and porcupines, but is always superior to the number employed by machine makers.

While with ordinary lighting often no dirt can be seen falling out at the lowest part of the grid, one has only to hold the hand under this part to feel the prickling caused by leaf and other fine impurities propelled by the beater.

The average result with this grid from tests in over 100 mills is 42 per cent. increase in cleaning, and a saving of cotton from picker waste per year and per section of lappers of 4,560 pounds.



GRID WITH COMB.
Robert Schaellibaum Company, Providence, R. I.

The cotton being more thoroughly loosened, principally by the action of the comb, and partly also by the greater number of bars, the cotton is spread much more evenly on the screens, thus makes the laps evener for every smallest

fraction, and slivers from cards and drawing frames have their variations in weight reduced from 40 to 50 per cent., according to numerous tests.

As one inch of finisher lap makes about eight feet of card sliver, 48 feet of first drawing frame sliver, 288 feet of second drawing frame sliver, and so on, it will be realized that evenness of laps to the smallest fraction is important.

While mills pay only for an attachment to that class of machines of which they have the smallest number, they get improvement in the running of all other classes of machines of which they have much larger numbers.

BREAKER LAPPER.

The machine herewith illustrated contains many improvements, among which may be mentioned the calender head, which allows the machine to be stopped by a drop handle without breaking the lap. When the lap is of the required length and the machine knocks off, the lap is not broken, as the large lap rolls and calender rolls, also the feed apron and cages, etc. This improvement prevents the softening, and consequent stickiness and splitting of laps through constant revolving after the machine has knocked off. It also enables the machine to be stopped at any time during the formation of a lap without breaking the lap. The lap-racks slide up and down on steel shafts, which entirely prevent the tilting of the racks, and consequent breakages.

The makers build single and double beater machines, and when more than one beater is required the first one can be either a 30-inch diameter cylinder beater or an 18-inch rigid beater. The use of the rigid beater three inches larger diameter than the ordinary 15-inch allows more space for the grid bars and greatly improves the cleaning capacity of the machines.

Gauge boxes and condensers are supplied when desired in connection with all styles of breaker lappers, for use with automatic cleaning trunk, conducting trunk or galvanized pipe. This attachment is simple, gives a very even feed and is especially adapted to conditions where the cotton has to be conveyed some distance. The gauge box is fitted with glass on the two sides and front, thus affording opportunity to observe and regulate the feed. The fan for conveying purposes is placed conveniently under this section of the machine. The construction of these machines enable the top cage to be easily removed. To remove the cage or bushings it is only necessary to turn back the cover.

The stopping and starting of the calender rolls is effected by means of large clutch gears instead of a drop shaft and gear. By this method instead of one tooth in the gear taking all the starting strain and thereby causing considerable breakage, the strain is distributed over all the teeth in the clutch gears, entirely preventing breakage.

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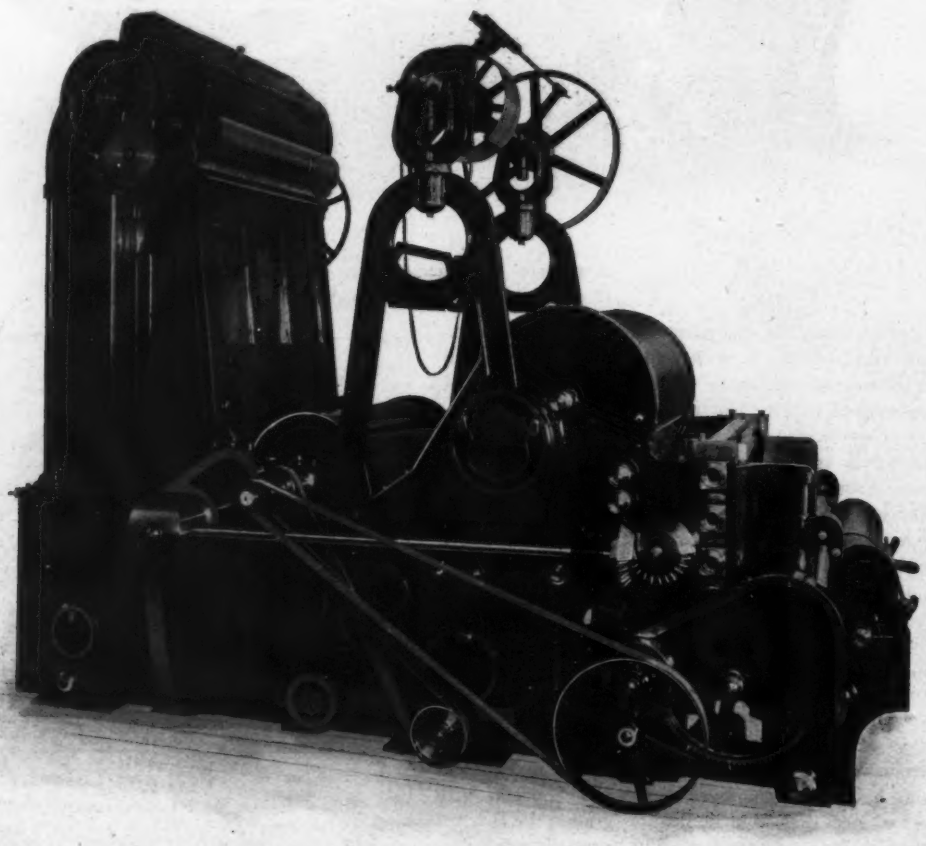


SINGLE BEATER BREAKER LAPPER WITH GAUGE BOX AND CONDENSER.
Howard & Bullough, Pawtucket, R. I.

A GRID.

We illustrate herewith a grid for cotton openers and lappers, possessing some novel features of valuable and practical advantage to machines to which it may be attached.

The brackets are made of the best cast iron, carefully fitted and inspected to make sure that they are perfect. The lugs separating the bars are cast into the side of the brackets.

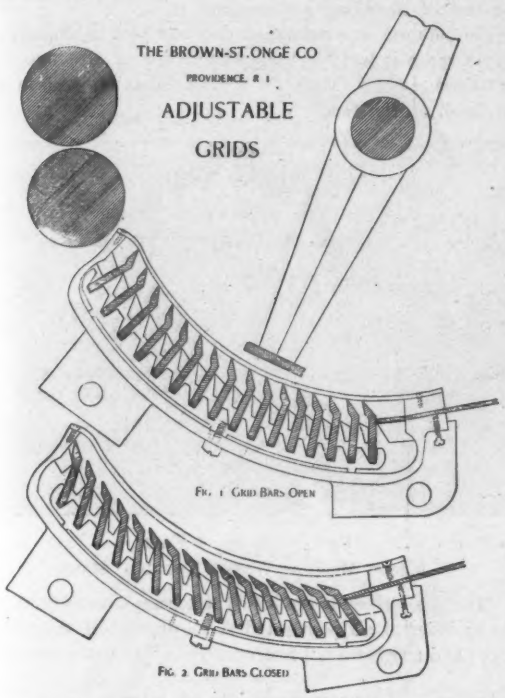


FIG. 1 GRID BARS OPEN

FIG. 2 GRID BARS CLOSED

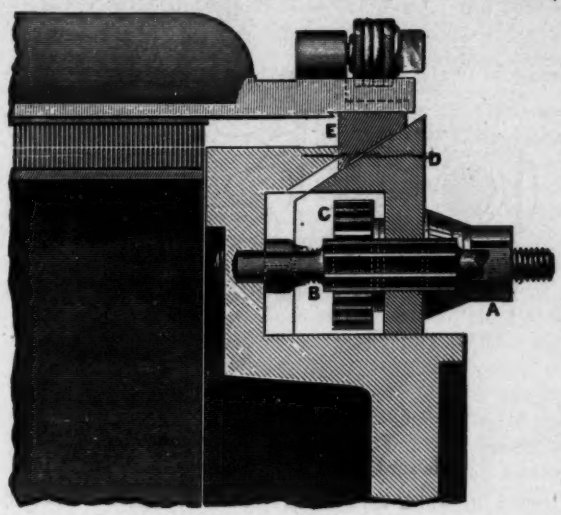
The bars are of a high grade crucible rolled steel, having an angle near the top of each bar to prevent motes being drawn back into the machine after once passing through the grid, and this angle also gives a sharp striking point on every bar from top to bottom of the grid, it making no difference at what angle the bars are set, being impossible to get a flat grid, no matter how much the space between the bars is closed up. They are finished smoothly so that no cotton or other substance can catch and clog up the grid.

The adjustment is accomplished by moving the slidable rack which holds the bottom of the bars up or down in the bottom of the bracket, thus tilting the bars to any angle desired for the particular grade or staple of cotton used or amount of cleaning required, this adjustment being accomplished on all bars at once, thus obviating the necessity of setting each bar separately and only requiring a couple of minutes to change the setting as desired.

REVOLVING FLAT CARD.

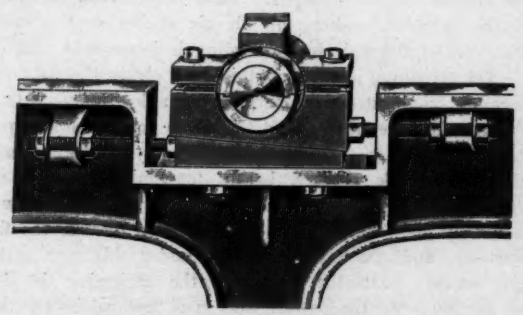
The revolving flat card made by Howard & Bullough, Pawtucket, R. I., has many valuable characteristics that have long been recognized by cotton manufacturers.

The cylinders and doffers are balanced at a very high speed, and ground to a true and polished surface after being turned, making a smooth and true foundation for card clothing. Cylinders and doffers are clothed to the extreme edges with perfectly straight edges, preventing ragged selvages in the web. The doffers (3-8 inch wider than cylinders, to keep the edges of the latter clean) are provided with flanges to protect the edges of the clothing and keep them firm, and prevent the wire from being knocked down. The edges of the cylinders are protected all the way round by turned iron flanges on the bends, and by turned iron flanges or segment rings, fixed to the inside of the lower part of framing. The segment or flanges are fitted close



SETTING ARRANGEMENT FOR FLATS.
Howard & Bullough, Pawtucket, R. I.

to the edges of the cylinders, and project and form a circle two inches larger than the diameter of the cylinders. To these turned rings the under-screens are attached on each side. This arrangement makes it impossible for the fly to accumulate inside the screens or about the edges of the cylinders and doffers. All bends and flats are perfectly concentric with the cylinders at every point until the clothing is worn out.

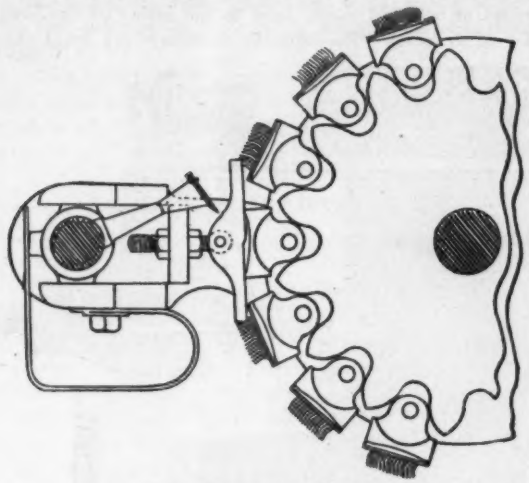


ADJUSTABLE CYLINDER PEDESTAL.
Howard & Bullough, Pawtucket, R. I.

The conical concentric bends have five setting points on each side of the card, each of which is provided with a graduated dial by which the flats are adjusted; the setting arrangement being herewith shown and described as follows: As the index *A* and the toothed nuts *C* are turned one way or the other, they move the rigid bend *D* in or out, and thereby raise or lower the corresponding flexible bend *E* which rests upon it. As the flats rest upon the flexible bend *E* they are raised or lowered with it. Each mark or division on the index nuts *A* represents one-thousandth part of an inch, and by turning the nuts the distance of a division the flats are raised or lowered to

this extent. The adjustment of the flats to the cylinder is rendered easy and certain—the dials are in full view of the carder, and he can see exactly how much he has lowered or raised the flats.

The card has adjustable cylinder pedestals, here illustrated, by which the cylinders can be re-adjusted vertically or horizontally, if ever required. The steps of the pedestals are made of phospor bronze, which is very durable.



FLAT STRIPPING MOTION.
Howard & Bullough, Pawtucket, R. I.

Each card is provided, when desired, with an arrangement for driving the cylinder and doffer at a slow speed (cylinders three revolutions, and doffers five revolutions per minute) while grinding, and at the same time driving the two grinding rollers at from 800 to 1,000 revolutions per minute, without removing, crossing or uncrossing the main driving belt of the card. All mote knife plates are made of steel polished inside and out and curved to the surface of the cylinder. Each plate is set by gauge to the cylinder, making up all air spaces so that accumulation of fly and cloudy carding is impossible.

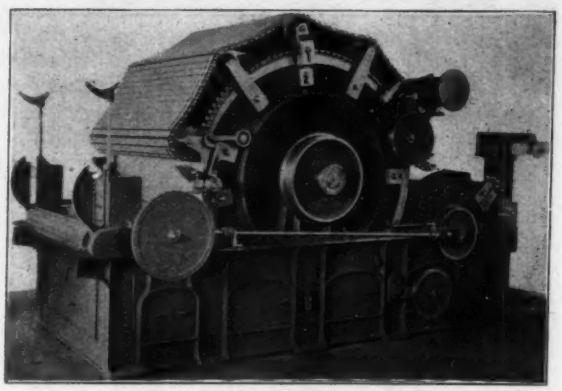
The stripping motion on this card clears the flats uniformly. The system here employed enables the comb to be the same distance throughout the whole flat, hence stripping uniformly, and practically doing without brushes, or using them as simple dusters, barely touching the wire, and running one-tenth their usual speed. Ordinary wear naturally makes the length of the chains driving the flats variable, and the flats "tilt" but under this new system no matter what the "tilting," the stripping is done as perfectly as the newest and most accurately set flats. Should dirt get underneath the flats and force them away, no difference is caused in the perfect stripping, as the comb follows the flat. The bearings are kept at a given distance from the flats by means of a shoe, which presses against the working seating of the flat, the shoe and seating being practically of the same width on the face. The shoe is so shaped that it allows for the "heel" of the flat, and thus ensures the comb being always kept at the proper distance from the wire, and preventing the possibility of any damage to the latter. The comb being centered at a point in front of the chain or flats and striking in a circle below the line joining the centers of comb-stock and front chain block, gives a receding motion to the comb blade, causing it to effectually pull all impurities out of the wire.

REVOLVING FLAT CARD.

The principal features of the revolving flat card illustrated herewith are in the design and finish of those parts which are of vital importance in the production of good work.

The cylinder, doffer and licker of this card are each cast solid, with its arms and stiffening and balancing ribs, obviating the possibility of errors in fitting and weaknesses. Cylinders and doffers are cast without a cooling strain by a system of moulding and casting.

The flats are so constructed that end play is impossible, and no space is left for the accumulation of side waste, or for "blowing-out." They are ground absolutely true to size and finish on the face.



REVOLVING FLAT CARD.
Mason Machine Works, Taunton, Mass.

The flexible bends are tested to ensure concentricity with the cylinder at all points and at all degrees of wear of the wire; and any bend not conforming to this test is destroyed.

REVOLVING FLAT CARD.

We show in this connection a carding machine that has been installed in a large number of cotton mills in this country. It has a 50-inch cylinder, with 109 or 110 flats, 1 3-8 inches broad, 44 of which are constantly at work.

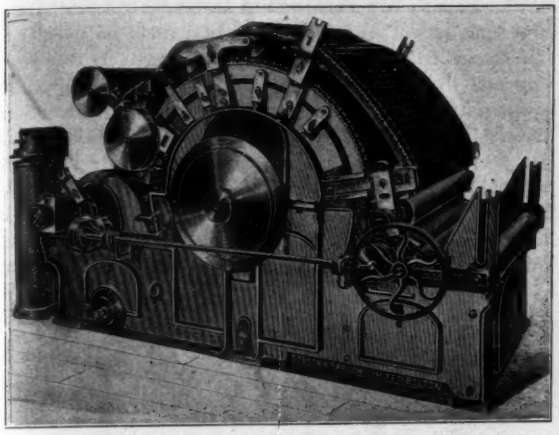
The flats can be adjusted to the smallest fraction of an inch. Absolute certainty is insured that every flat is concentric with the cylinder and does its proper share of work.

The flats are covered with wire their whole length, except just their bearing surfaces. They are very strong, and are made from specially designed patterns, and are as short as it is possible to make them for the width of the cylinder. They are trued up by special apparatus to the one-thousandth part of an inch.

Each flexible is tested on its whole surface in every possible position it can assume by an apparatus which denotes a variation to the one-thousandth part of an inch, before the card leaves the works. The cylinder and doffer are clothed up to the extreme edges, the engine sides are turned inside, so that the cylinder fits close up to the card sides, dispensing with packings or wood linings; there are also flanges and other protections to prevent damage being done to the edges of the card wire. By these and other improvements perfect selvages are made, and an extra width of lap can be worked in the same floor space. This card is made one inch narrower on the wire than the width lap to be worked.

The taker-in is covered with inserted saw-tooth wire, 6,

8, or 10 coils to the inch, according to the quality of cotton to be worked. It is always clean, requires no grinding, and the ends are well shielded to protect the wire from damage. One of the greatest and most important features of this card is the simple and accurate manner in which the taker-in and all its connections are arranged to be set simultaneous with one adjustment or set individually; also the simultaneous setting of the doffer cover and all other connecting parts.



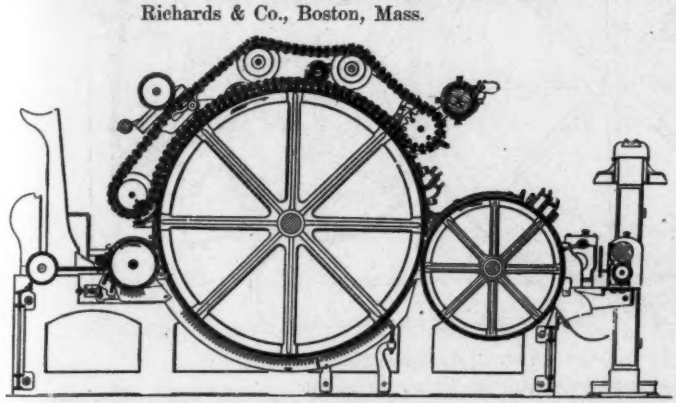
REVOLVING FLAT CARD.
Dobson & Barlow, Represented by Stoddard, Haserick, Richards & Co., Boston, Mass.

REVOLVING FLAT CARD.

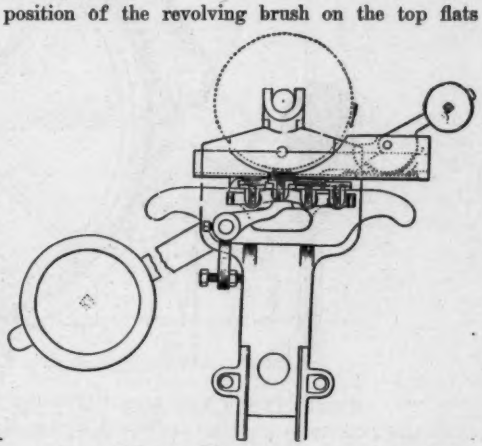
The revolving flat card herewith illustrated is one of the latest improved type of this type of carding engine, the cylinder of which is 50-inch diameter, either 40-inch or 45-inch wide as may be desired, and is run in bushings placed in pedestal boxes. These bushings can be renewed when worn without requiring a new box. The card is heavily proportioned, well ribbed and stiff. The cylinder is ground perfectly true and balanced to double the speed required. The flats are not subject to a straightening process but are ground to an even smooth surface.

Some of the improvements peculiar to this card are: Adjustable under-screen with extra heavy knife blades, stands and attachments; all arranged so that the first setting of the screen at the junction of the licker-in and cylinder is maintained, and is governed wholly by the setting of the licker-in. The knife blades under licker-in, which are used for removing motes, have an independent adjustment whereby they can be placed in varying positions to get more or less waste, the latitude of these variations being very great. When finally set in place they move with the licker-in and screens. The arrangement of the licker-in roll boxes and shields may be noted whereby the setting of the licker-in controls the position of the screens underneath. This does away with the trouble of cotton getting into the ends of the licker-in and causing heat and annoyance.

The position of the revolving brush on the top flats



REVOLVING FLAT CARD WITH 27" DOFFER AND 110 TOP FLATS.



GRINDING DEVICE.

The Whitin Machine Works, Whitinsville, Mass.

An important feature in this card is the cylinder and doffer cover with making-up piece combined; this is made of polished steel inside and out, hinged together and arranged on the concentric principle. It is adjustable according to the wear or length of card-wire, and it dispenses with the necessity of removing the covers when stripping and grinding; for this operation, the hinged part of the cover next to the cylinder is turned down, and to insert the setting gauge between the cylinder and doffer the whole appliance is moved eccentrically over the doffer and retained by a catch in a notch. That part which descends between the cylinder and doffer is planed to a knife edge and polished so as to prevent cotton from clouding or forming "cat tails." This combination makes up the space between the cylinder and doffer, and is an absolute preventive of air accumulations or the blowing out of waste or loose fibers.

is such that one is enabled at all times to readily clean any lint and waste that may collect between the flats, and to ascertain whether the tops are set properly on the carriers.

The card grinding device shown in this connection is a simple and reliable method for grinding the top flats of a revolving flat card. The grinding surface, in distinction to the carding surface, of the flats, is done away with, both operations being performed from the same face. The flats are supported on the same face and in the same place when grinding as when carding, consequently the original pitch is maintained, and the flats in position on the flexible bend can all be set by the same gauge to the cylinder.

The device will be easily understood by reference to the sectional view. At the top will be seen the bridge bracket in which a rack and bar slide. To this bar is attached a shoe or pin (shown across the end of the

raised flat) the lower surface of which is milled to the particular bevel at which it is desired to grind the flat. The position of the carding surfaces of the flats when grinding is regulated by the shoe or pin, and the action of the lifter (shown as supporting the raised flats) with its levers, one of which is loaded by the large weight at the left. Each flat as it travels along seizes the lip of the shoe and is carried along until the clothed surface has passed under the grinding roller. The flat then drops off the lifter, and releases the shoe, which is immediately returned to its original position by the positive movement of the rack quadrant and small weight at the right.

REVOLVING FLAT CARD.

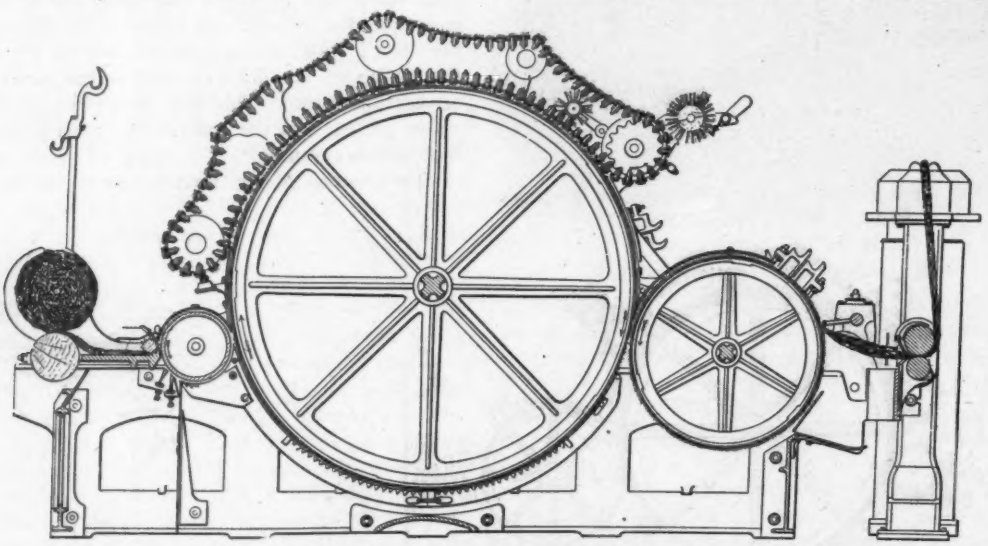
The revolving flat card herewith illustrated in sectional elevation is built 40 and 45 inches in width. The 40-inch cards have a doffer 24 or 27 inches in diameter, as may be desired. Cards 45 inches wide have a doffer 27 inches in diameter. All the cards have 110 flats, and the main cylinders are all 50 inches in diameter.

ively adjustable, being fixed permanently to the short bend or make-up piece, which swivels on a stud in an adjusting stand, which also carries the grinder stands. The stripping plate and doffer knife, being once adjusted in right relation to the cylinder and the doffer, are collectively adjusted to the cylinder by one screw as the card wire wears, and thus the same relative positions are maintained.

The cylinders are made in one casting with sectional and longitudinal ribs that make a strong and very rigid shell. This shell is bored out at the ends, and heavy cast-iron ends turned on the edges are then fitted in.

The cylinder shafts are ground to a perfectly true bearing and the whole cylinder is turned and ground on its own bearing, not on an arbor, to an absolutely true surface. It is then balanced by a special device that insures its perfect running. Every cylinder and doffer is tested at high speed before leaving the shop.

The total number of flats on this card is 110, giving a maximum carding surface exposed to cylinder at one time of about 1720 square inches on a card 40 inches wide.



REVOLVING FLAT CARD. SECTIONAL ELEVATION.
Saco & Pettee Machine Shops, Newton Upper Falls, Mass.

The arrangement of parts around the licker-in of this card is much appreciated by practical carders. The boxes or bearings are so arranged as to carry the licker-in, the licker-in knives, licker-in screen and back edge of cylinder screen. Each of the above parts is separately adjusted on the licker-in box, and when once adjusted in the right relation to the cylinder and licker-in the whole moves collectively, so that as the card wire wears and it is found necessary to set the licker closer to the cylinder, the one adjusting screw, for adjusting the licker-in, moves the whole of the above parts, all retaining the same individual relation to each other. Every adjustment is outside the frame and can be made conveniently without getting under the frame. The licker-in mote knives are all steel, with edges ground true, and the knife adjusting stands are made so that the knives can be set to any required angle in relation to the licker-in. This is a feature which makes it possible to adjust the knives so as to clean any grade of cotton without making too much fly under the licker-in.

The front knife plates are independently and collect-

Each grinding roll is provided with a pair of bronze bushings, resting in V-shaped grinder stands on the card. From this arrangement results a ball-and-socket combination with the maximum of bearing surface and accuracy and the minimum of wear and tear.

A flat grinder and cradle device belonging to this card enables the flat to be ground from the same surface that is bearing on the bend when the flat is working, so that if any wearing of the flat is caused by the passage on the bend, it will never affect the efficiency of the flat while at work. One cradle only is required for about twenty cards, and it is easily changed from one card to another, or can be hung clear from the flats when not in use. As this arrangement simply rides or floats on the flats, it is easily adjusted.

The coiler is of special design and one of its claimed advantages is the open top, which allows the operator to lift the cover of the coiler without stopping the machine. The coiler can be oiled in all of its parts while running.

Another feature is the hinged or swinging calender roll in the coiler, taking the place of the old-style fixed calender roll.

REVOLVING FLAT CARD.

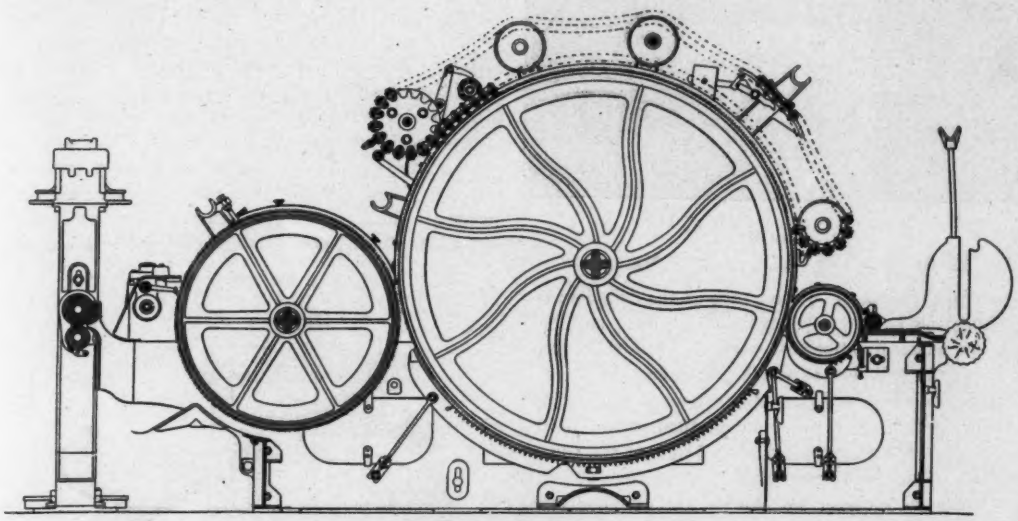
The sectional view of a revolving flat card which we illustrate is built with cylinders 50 inches in diameter and 40 inches or 45 inches wide on the carding surface, with doffers 28 inches. The spiders are cast solid with rims and shafts inserted by driven conical bushings. Main bearings are made of phosphor bronze, channeled for oil distribution and provided with removable oil cups. There are 108 1 3-8 inch flats to which clothing is applied by a new patented clip. The flat grinding stands are located on back of card and flats are ground from their working surface. An inside flat cleaning device is applied, strippings are wound on a roll in front of card and flat carrier pulleys have effective scrapers to prevent accumulation of dirt on same.

The licker-in is 9 1-2 inches diameter covered with garnett wire. The licker-in screen is adjusted with the licker independently or together. There are two adjustable mote knives. The weights of feed rolls are placed down on sides of cards to prevent interference with lap rods. Feed rolls can be rolled out when weights are removed and scavenger roll remains in place, all being an operation one man can perform. Lap stands are quickly removable without the use of wrench. The flexible bend has the standard five point setting but bends are supported on their centers of gravity rather than by sidewise studs. Several effective devices are provided to insure self-cleaning on inside of arch and the preventing of side waste. The front door latch is of novel design in which the throwing open of the door is done from one side, the joint of door clears itself of dirt in opening and arm used in throwing open door is extended to form the lever and is provided with a compression pin which secures the door in place.

The comb box is of a new design with a long stroke eccentric insuring the clearing of the doffer on heaviest production and avoiding the necessity of operating comb over 1350 R. P. M. The side shaft from doffer to feed roll is disengaged by a new form of clutch instead of springing out in old construction. About the comb is placed draft plates and dust pan. The web takes a downward course from comb to calender rolls and ends coming down is reduced to a minimum. The selvage of the web can be strengthened where laps having ragged selvages are run, with the adjustable lap guide on the lap stand just above feed plate.

The screens of card are rigid in construction and adjustable from outside of card.

Coilers are made for 10-inch, 12-inch or 14-inch cans. The coiler head cover design dispenses with dragging the sliver over face of cover. The head can be opened up and oiled while sliver is running and the stand itself is oiled while can is in position. The coiler head requires but little cleaning and opens completely by easy operations. All parts of cards made during the same period of design are made interchangeable.



REVOLVING FLAT CARD.
Lowell Machine Shop, Lowell, Mass.

SETTING THE FLEXIBLE BEND.

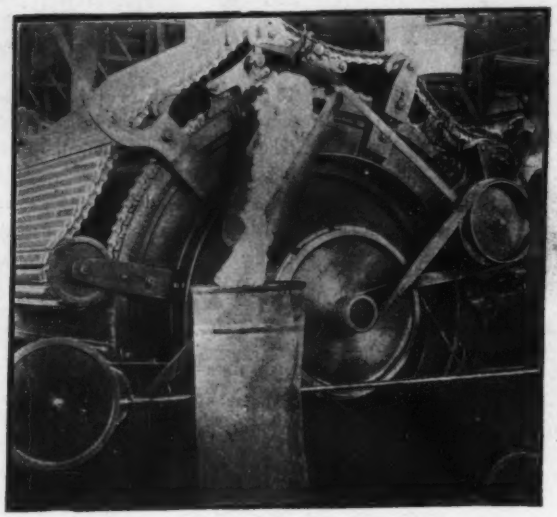
The flexible bend on the Hetherington revolving flat card is provided with five setting points, and is fixed to the frame bend by a screw at its center. This screw passes through a radial slot in the frame bend, the flexible is therefore at liberty to pivot on this stud within certain limits, and can consequently be adjusted to the center of the cylinder should the latter become slightly displaced by reason of wear in the course of time. The makers consider this simpler than providing means to adjust the center of the cylinder, which they say is only adding a further and unnecessary complication to the machine by another setting point.

Plaster made with plaster of Paris, or gypsum, is a fairly good fire-resistant, and is somewhat improved when metal lathing is embedded in it at first, although in cases where the plaster has not entirely covered any metal wiring or lathing, it has been sometimes found that the latter has corroded badly and eaten away into the plaster.

Inquiries about anything pertaining to the textile business will be cheerfully answered by COTTON.

TOP STRIPPER ON THE REVOLVING FLAT CARD.

For nearly five years this attachment which we illustrate as an additional top stripper on the revolving flat card, has been under practical trial in the daily work of a large mill in Maine, where it has been tested under all the varying conditions of the average carding room, giving perfect satisfaction.



TOP STRIPPER.
The Batten-Hayes Co., Lewiston, Me.

This stripper is placed on the crown of the cylinder; the tops striking the back of the cylinder as usual and performing the usual functions of carding until they reach the crown of the cylinder, at which point the tops leave it in the regular traverse and pass up over an arch or bridge and are stripped as they proceed and then return to the cylinder clean and are stripped a second time at the end of the last half of the carding service,

The additional stripper on top of the cylinder takes out the larger leaf and removes it is claimed a much lower grade of stripping than the regular card does with twice the carding surface. The first half cards the cotton; the last half, the tops traverse on the cylinder more than doing the work of carding, but to some extent comb the cotton and make a special preparation for combed work, the staple being cleaner with more of the fibers laid in parallel. This extra stripper enables one to run the tops one-third slower, and, at the same time, the tops and cylinders are said to be kept cleaner.

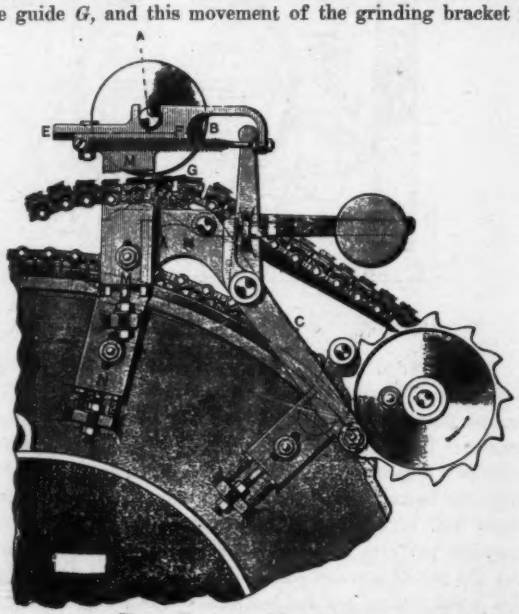
FLAT GRINDING APPARATUS.

The result obtained from the revolving flat card depends on the accuracy with which the various parts, particularly the flats, can be set, not only when they are new, but also when the inevitable wear of the ends takes place.

The object of the grinding apparatus, here shown, is to grind the flats from their working surfaces, and thus ensure that the height of the wire from that surface is identical in every flat, no matter how the working surface may wear in each flat. This would be easy enough if the surface of the wire were parallel with the working surface, but this is not so, for to ensure the necessary "heel" in the flat, the one side of the working surface is cut lower than the other, and is therefore not parallel with the surface of the wire. In order to grind from the working surface of the flat without destroying the "heel" the device is employed.

Screwed on to each side of the card is the bracket *N*, which serves as a tightening bracket for the chain, and has cast on to it the guide rail *G*, the underside of which has the same curve as the flexible. Screwed to *N* is the bracket *M*, provided with vertical adjustment so that the grinding roller may be set as the wire on the flats is ground down. The upper surface of *M* carries the grinding roller bearing, which is at liberty to slide backwards and forwards thereon, but is constantly drawn against the stop *B* by a spiral spring. This surface is made to stand quite horizontal, in order that the weight of the grinding roller may not act prejudicially on the other parts of the apparatus. The flats in passing are held up against the guide *G* by the weighted lever *D*. The guide *G* is set so as to form a given angle with the upper surface of *M*.

If the grinding bracket were stationary, the grinding roller would only touch the first or highest rows of wire on the flat as it passes across the radial line *AA* since the wire at the other side does not stand so high from the working surface owing to the necessary heel. Consequently, if the grinding bracket and roller were not displaced, the heel would gradually be ground out of the flats, the surface of the wire becoming parallel with the working surface of the flat. To obviate this the guide *G* is inclined at an angle to the upper surface of *M*, on which the grinding roller bracket slides. When therefore, the grinding bracket is drawn to the right it approaches nearer to the under side of the guide *G*, and this movement of the grinding bracket is

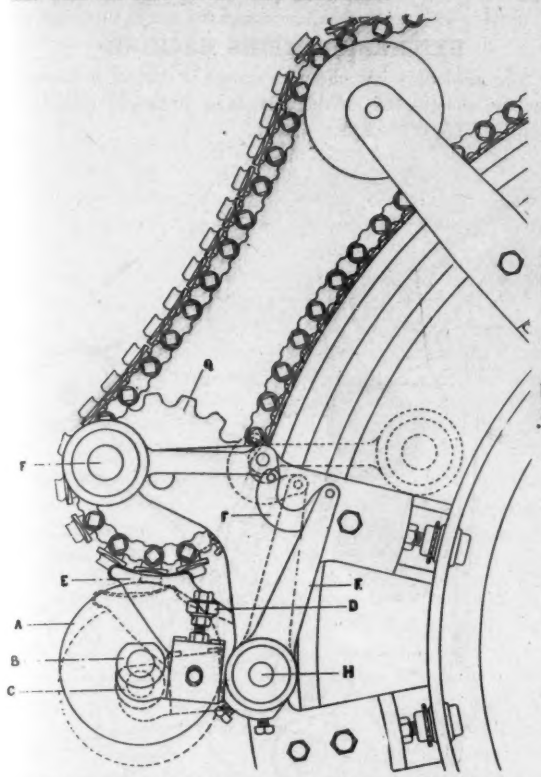


FLAT GRINDING APPARATUS.
John Hetherington & Sons, Represented by S. C. Lowe, Boston, Massachusetts.

operated by the star wheel, whose teeth have the desired form and which revolves with the flats, and acts on the grinding bracket through the lever *C* with adjusting screw. This star wheel is so set that when the first rows of wire of the flats reach the radial line *AA*, the roller begins to move to the right, and approaches nearer to the guide *G*, and consequently touches the wire right across. The flats are thus ground from their working surfaces without in any way affecting the heel.

GRINDING FLATS.

We show herewith an apparatus for grinding flats for the revolving flat card which for accuracy, ease of handling, and simplicity has received the commendation of manufacturers and overseers of carding. The apparatus grinds the flat with the face of the wire downward.



GRINDING FLATS FROM THEIR WORKING SURFACES.
Mason Machine Works, Taunton, Mass.

The grinding roll *A*, which is used, is similar to those used on cards of this type, and is preferably seven inches in diameter, runs in self-adjusting bearings *B*, and is supported upon V-shaped brackets *C*, which are adjustable by means of set screws and check nuts *D* upon the grinding shoe or yoke *E*, which is held against the working surface of the flat, during the operation of grinding, by the weight lever *FFF*. The pressure of the weight lever is applied immediately opposite the shoe, so that the flat can not be sprung during the grinding operation. The sprocket wheel *G* parallels the flat on the bend, takes up any unequal stretching that may occur in the flat chain, and allows the flat to approach and pass the grinder perfectly parallel. The shoe *E* has the surface which engages with the working surface of the flat, milled exactly to template, and is shaped upon a principle entirely different from that which is used on any of the other devices used for this purpose. It was reached only after careful study and exhaustive experiment, and is of such a shape as to ensure the grinding of the wire perfectly straight from heel to toe. All of these parts are pivoted upon the stud *H*, and, as each card is supplied with the apparatus, no removal of any part is necessary from card to card as the grinding is carried on.

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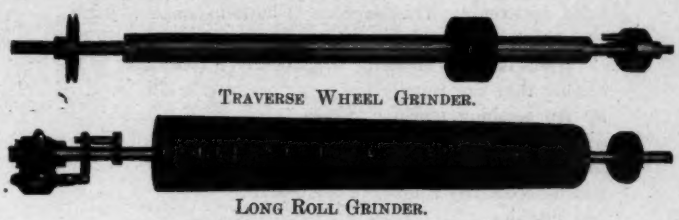
CARD GRINDERS.

The traverse wheel grinder here shown is used for grinding the cylinders and doffers. It is accurately built of the best material obtainable, so the wearing of the working parts is reduced to a minimum. The shell is made of seamless drawn tubing turned and ground. The bearings are hardened and ground. The screw which imparts the traverse motion to the emery wheel is cut and finished as accurately as modern machines can produce. The emery wheel is balanced carefully and covered with the best grooved emery filet. The grinder is carefully balanced and then tested with an indicator that registers to 1-1000 of an inch, to be sure they run perfectly true. A differential motion is furnished when desired. This motion takes the place of one pulley.



TRAVERSE WHEEL GRINDER.

LONG ROLL GRINDER.
T. C. Entwistle Company, Lowell, Mass.

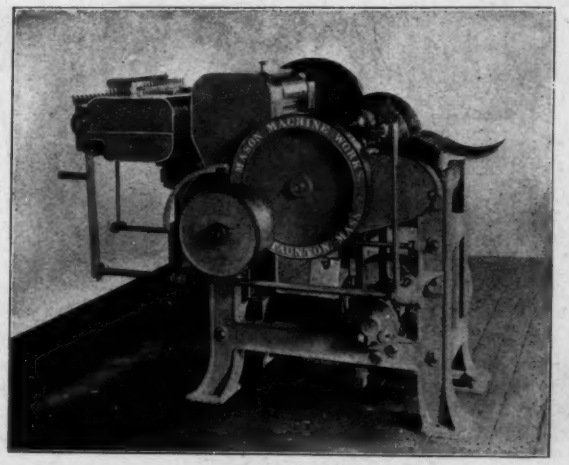
The long roll grinder also illustrated is used for grinding the revolving flats and are made of seamless drawn tubing, turned and ground accurately, with hardened and ground bearings. It is balanced so there is no vibration whatever when running at a speed of 2000 revolutions. The vibrator motion is very simple in construction, there being but few parts to it.

SLIVER LAP MACHINE.

The sliver lap machine shown herewith is well known to manufacturers who comb cotton and therefore requires no lengthy description.

As all manufacturers who comb cotton well know, the object of this machine is to take the slivers from the card, or coarse drawing frame, and unite them into a continuous sheet, or ribbon, and wind them upon a wooden spool for use on the ribbon lap machine, or comber.

From 14 to 20 ends are placed at the back of the ma-



SLIVER LAP MACHINE.
Mason Machine Works, Taunton, Mass.

chine, drawn through guides, and over stop motion spoons, and passed on to the drawing rolls, which are usually three in number. The draft in these drawing rolls is always kept as low as possible, and, to obtain the best result, it should not be allowed to exceed 2.50. From the drawing rolls the sheet of cotton is passed between two pairs of heavy calender rolls, which press the sheet into a uniformly condensed ribbon, which will unwind on the subsequent processes without splitting or licking.

Stop motions are provided on this machine, so that, when an end runs out at the back, the machine is stopped before the end has time to pass through the drawing rolls. A stop motion is provided to stop the machine when laps of any desired size have been made. The rack motion is provided with adjustments, so that both sides of the lap will build up evenly. This machine is built to make 7½ inch, 10 inch and 12 inch laps.

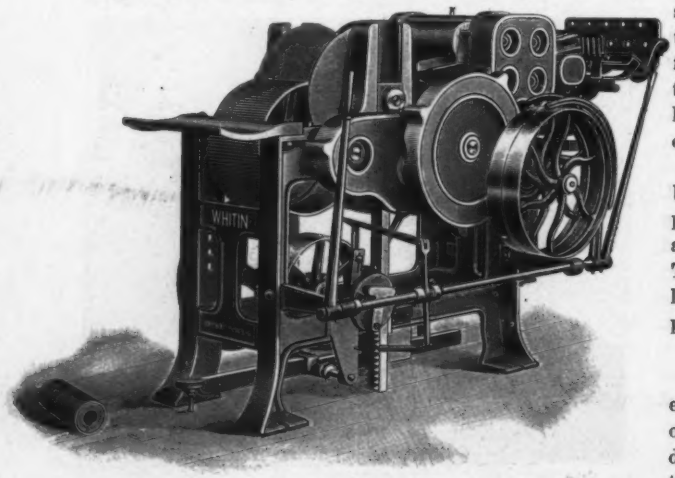
When the laps from the machine are taken direct to the comber they are usually made of the exact width required by the combing machine, which is about 8¾ inches, but when the ribbon machine is to used as a subsequent process they should be made narrower, to allow for the spreading which necessarily follows in the drawing process of the ribbon machine.

SLIVER LAP MACHINE.

The lap from the sliver lap machine shown herewith is formed by running from 12 to 20 card or drawing frame slivers, held in ordinary cans behind the machine, through guides and stop motion spoons to a drawhead consisting of three or four top and bottom rolls arranged with a slight draught.

From these rolls the cotton is condensed by passing through two pairs of heavy calender rolls and is then formed into a lap 16 inches in diameter. Machines of the following widths of laps are made: 9 3-4 inches and 12 inches. When the usual process of running the stock through a ribbon lap machine is used, the sliver lap machine laps should be narrower than if the laps were taken direct to the comber.

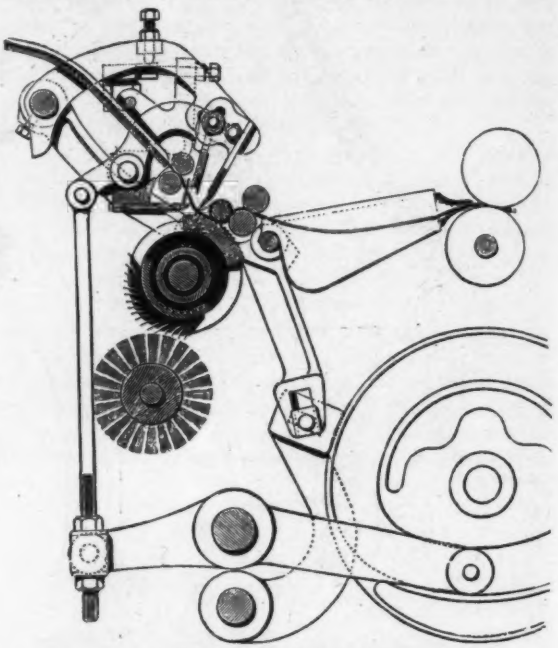
As it is essential that the laps made on this machine be of a perfectly uniform nature, a back stop motion is provided for each sliver, which causes the machine to stop instantly on the breaking of an end. Another stop motion is used which stops the machine when the lap reaches its full diameter, thus insuring the laps to be of uniform length. The rolls in the drawhead should be spread from one-quarter to three-eighths inches over the length of the staple used.



SLIVER LAP MACHINE.
The Whitin Machine Works, Whitinsville, Mass.

HEILMANN COMBING MACHINE.

The sectional view herewith shown is that of a combing machine constructed on the Heilmann principle with some simplified improvements.



HEILMANN COMBER.
Dobson & Barlow, Represented by Stoddard, Haserick, Richards & Co., Boston, Mass.

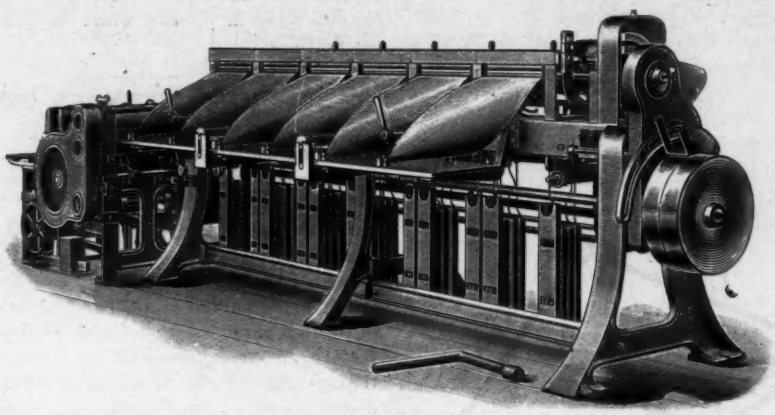
The notch wheel, with all its connections, is dispensed with; these are substituted by a quadrant and clutch gear, or a friction cone. The cylinders, built on round stocks, are always a true circle, and perfectly concentric to the cylinder shaft. By the shape of the comb-strips, flocking is entirely prevented, and perfect stripping of the same by the brush is ensured; each comb strip and half lap can be changed independently with perfect accuracy.

The brush driving device is so arranged as to drive the brush at variable speeds as the bristles wear down, thus preventing much loose fiber from flying about the room and getting mixed with that which has already been combed. The cams which work the nippers and detaching roller lifters are placed in the middle of the machine to dispense with all torsion.

The quality of being mercerised is not an adherent property of any special variety of cotton, but rather the ability of its fiber to withstand the tension. In order that this condition be realized with short-stapled fibers, cohesion among the individual fibers sufficient to allow of the high tension required must very often be induced by increasing the twist or number of turns.

RIBBON LAP MACHINE.

The ribbon lap machine herewith illustrated is built in two sizes to double either four or six laps, as preferred. The object of this machine is to so prepare the laps for the combing machine that the web of the slivers will be of a more even and uniform structure than that of the sliver lap machine, thus placing the fibers in a better condition for the action of the combing machine.



RIBBON LAP MACHINE.
The Whitin Machine Works, Whitinsville, Mass.

Four or six laps from the sliver lap machine, each 9 3-4 inches wide, are placed in the ribbon machine creel and drawn through four lines of fluted rolls. Highly polished, curved brass plates guide the ribbon evenly on top of each other on the sliver plate, along which the ribbon is drawn through several press rolls to the lap head, where it is compressed and formed into a lap 12 inches wide, and 16 inches diameter ready for the combing machine. The machine is provided with a back stop-motion which stops the machine whenever a lap in the creel breaks down or runs out; a full lap stop-motion in the lap head which insures the laps to be of uniform length; and also a stop-motion which prevents breakage due to lap winding about the front rolls.

A weight relieving motion is also provided whereby the pressure on the top rolls may be removed when desired, thus preventing the flattening of the leather covering of the rolls as would happen without this device if left under weight pressure any length of time.

Extra laps are held on a "low down" creel at back of machine thus permitting the employment of smaller help.

The draught is from four to six according to the number of doublings, but varies to some extent, as the sizing for the combing machine is done on this machine.

THE ALSATIAN COMBER.

In all essential features this machine (represented by Stoddard, Haserick, Richards & Co., Boston, Mass.) is a Heilmann comber, embodying in its construction the principles of the original Heilmann, but to these are added many new features, the application of which has produced some remarkable results.

This comber was placed upon the market in Europe in 1895. The first machine was sent to the United States in 1898, and since then many have been installed in some of the mills of New England and to an extent in some of those in the South.

This comber differs from all other cotton combers in being a single headed machine. Its production is said to nearly double that of the six headed machines hitherto in general use.

The heavy production and the extreme clearness that are claimed for the combing are attained as follows:

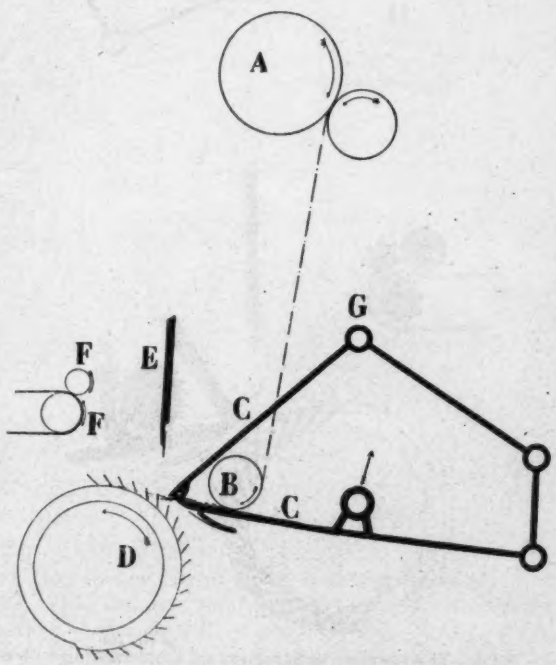


Fig. 1.

First—The comber is so constructed that it can handle successfully a lap many times heavier than laps ordinarily used.

Second—The combing cylinder has a large diameter with an unusually large number of needle bars.

Third—The position of the nippers in presenting the cotton to the circular comb is such that the circular comb can act much more effectually.

Fourth—The top comb falls after the circular comb has acted, and the position of the cotton at that time is

such that this organ falls clear through the fiber instead of falling only part way into it. In addition, the top comb performs a further movement after falling, towards the detaching-rollers. By the above action of the top comb all the long fibers are prevented from going into the noil, and the percentage of noil is reduced.

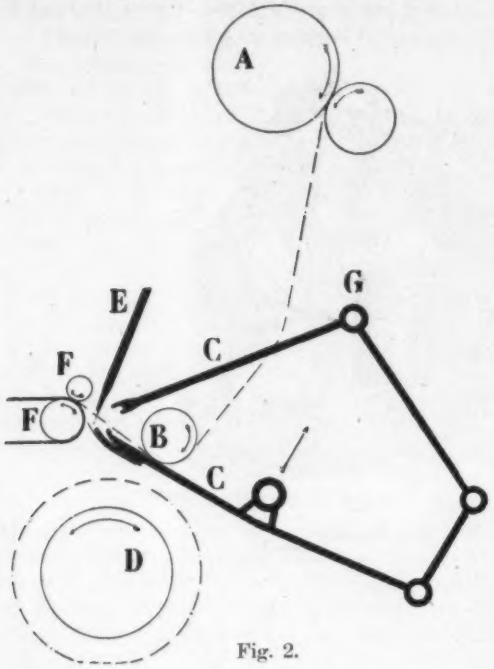


Fig. 2.

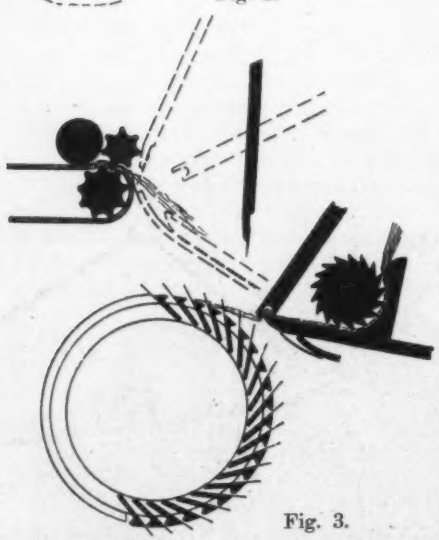


Fig. 3.

Fifth—The peculiar construction of the detaching rollers enables a very wide lap to be worked, viz., 10 1-2 inches. By referring to the appended illustrations it will be noticed that the axes of the circular comb and the detaching rollers are stationary, but all of the other parts independent of their separate motion have an oscillating motion together, forward and back from the circular comb to the detaching rollers, and vice versa.

Referring to Figures 1, 2 and 3, *A* shows the lap, *B* the feed roller, *CC* the nippers, *D* the cylinder comb, *E* the top comb, *FF* the detaching rollers and *G* the axis of the oscillating motion above described.

Figure 1 shows the relative position of the various organs when the nippers are closed, the circular comb acting.

Figure 2 shows the relative position of the organs after the cylinder has acted, the top comb fallen, the nippers opened, and the detaching rollers acting.

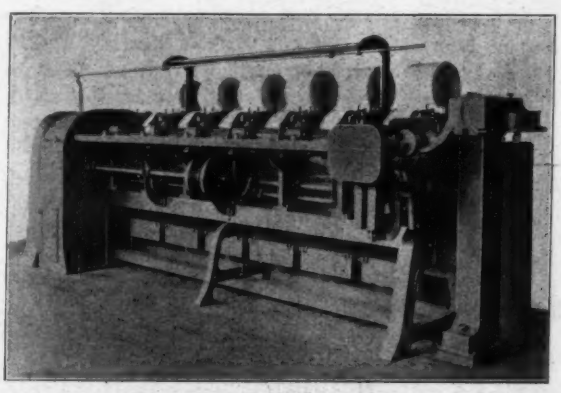
Figure 3 illustrates the above more clearly. The heavy lines show the nippers closed, the cylinder acting; the dotted lines show the nippers opened, the top-comb having fallen and being in position when the feeding and detaching are finishing.

MASON-HEILMANN COMBER.

The cotton comber which is shown herewith possesses many original American ideas that have commended themselves to manufacturers. These machines are built usually with six or eight heads for 8½, 10 and 12 inch laps.

In designing this comber, the makers have departed from the usual construction of combers, in that the pulleys, cams, notch wheel, feed gearing, etc., are not placed at the end of the beam and overhanging it, instead there is a head end with separate support for all of these motions, and this feature, in connection with the stronger parts employed throughout, and the additional bearings have been introduced to prevent the vibration so prevalent in machines of this description. All the head end gearing, feed motion, cams, etc., are encased, thus reducing the liability of help being caught in the working parts, making the machine more cleanly and giving it a more finished appearance.

The cams are placed in the center of the machine, thus equally dividing strain and eliminating the torsion. Where machines are built with eight heads or over, two cams are used, and each cam placed in the middle of each half of the comber.



COMBING MACHINE.
Mason Machine Works, Taunton, Mass.

This machine is made to suit the individual preferences of manufacturers, with the leather cushion on the lower plate or upon the nipper knife.

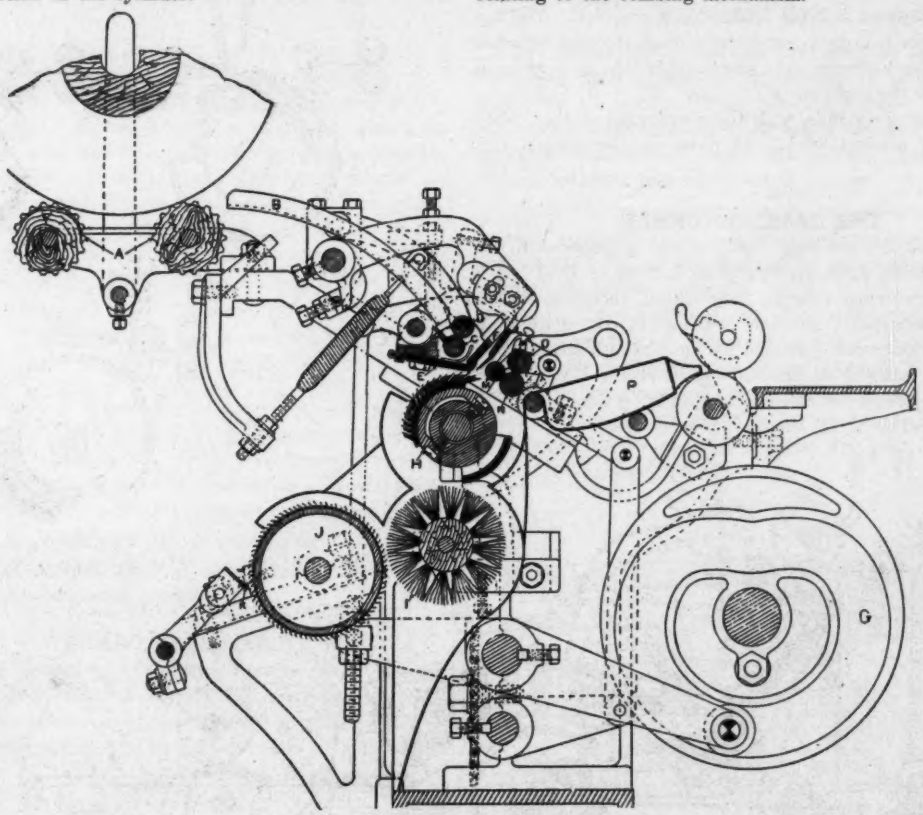
The operation of this comber will be understood by an examination of the accompanying sectional view of the working parts described as follows:

The laps are placed on the two wooden rolls, *A*, which are driven by gearing from the feed roll at a speed corresponding to that of the cotton through the comber. It then passes down the guide plate *B*, which terminates immediately in the rear of the feed roll *C* and top feed roll *D*. These feed rolls are fluted in the ordinary manner, and the

bosses are a little longer than the width of the lap. The top feed roll is held down by means of a spring secured to the framing of the machine, and is driven by frictional contact.

Immediately in front of the feed rolls are the nipper plate *A* and cushion, and top nipper *F*. The top nipper *F* has a fluted under-surface, which engages with a leather covered cushion on the nipper plate *E*, and the contact between the two enables the cotton to be gripped and held firmly while the process of combing is being performed.

When the feed roll has fed through a sufficient length of cotton, its relation ceases; the top nipper is depressed by the continued revolution of the nipper cam *G*, and the nipper frame is carried back until the protruding tuft of cotton in the lap is directly in the path of the needles of the combing section of the cylinder.



SECTION OF COMBER.
Mason Machine Works, Taunton, Mass.

The foregoing may be described as relating to the feeding mechanism of the machine.

The combing cylinder *H* (or, in mill parlance, the "half-lap") is composed of two sections, one, the combing portion consisting of rows of needles mounted on brass strips, and a fluted segment which carries along the tuft of cotton previously combed. These rows of needles vary in fineness from coarse needles and coarse settings of the first rows to enter the lap, to fine needles and fine settings of the last rows to enter the lap. The action of these needles is to remove from the protruding tuft of lap all the short fibers which are not held firmly by the nipper. The waste is removed by the brush from between the combing needles, and is deposited on the doffer *J*, which is clothed with a special form of toothed clothing, to remove the waste from the bristles. The waste or "noil" is subsequently removed by the doffer comb *K*, and falls into waste boxes placed for that purpose.

After the combing needles have all passed, the top nipper begins to recede by the continuation of the revolution of the nipper cam. The fluted segment of the cylinder is brought into position, and the combed ends of the lap lie on the flutes. The top comb *L* commences to drop into position ahead of the uncombed end of the tuft, and the leather-covered detaching roll *M* is lowered on to the cotton lying on the fluted segment. The combing cylinder continues to revolve and the cotton is carried forward. The top comb being down in place, that portion of the tuft held by the nippers is combed by the top comb during the forward passage of the cotton. The foregoing may be described as relating to the combing mechanism.

The detached tuft of cotton must now be placed up to the cotton that has been previously combed, in order to make a continuous sheet of combed cotton. To accomplish this, the detaching rolls *N* and *O* are utilized, and they are made to revolve backward about one-third of a revolution by the action of the detaching cam, notch gear and internal gear operating the bottom detaching roll *N*. This backward motion brings with it the combed web which is slack in the sliver pan, and pieces up the tuft of lap to the previously combed web.

The piecing-up having been made, the detaching rolls become stationary, the top comb is raised, a new length of lap fed in, and the process of combing commenced afresh.

The combed web is then gathered and passed through the trumpet of the sliver pan *P*, between the calender roll

and along the sliver table up to the draw box, and thence to the coiler, where it is coiled in a can similar to that of a drawing frame.

It will thus be seen from the foregoing description of the mechanism that the lap is fed from the lap rolls to the feed rolls with an intermittent motion, the length of the lap fed in being regulated by means of change feed gears to suit the length of fiber to be combed. The lap is then passed down the guide plate, between the upper and lower feed rolls, which pass it between the open jaws of the upper nipper and lower cushion plate.

The nippers then close, and, while the lap is firmly held, the needles of the combing cylinder pass through, removing the short staple and much of the impurities left after the carding process.

The combed end of the lap is then carried forward by the fluted segment and the leather detaching roll. The top comb is lowered so as to enter the ends of the new detached tuft, in order to remove the short staple left in it where it was held by the nippers.

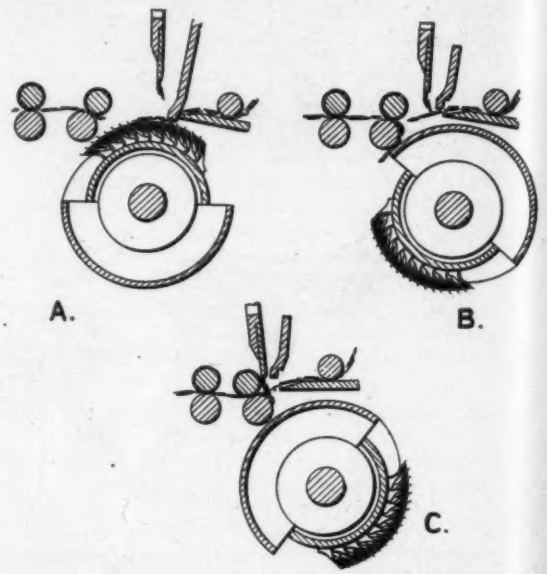
The piecing-up rolls, with their backward motion, bring the already combed work, and piece up the combed tuft to it.

THE NASMITH COMBER.

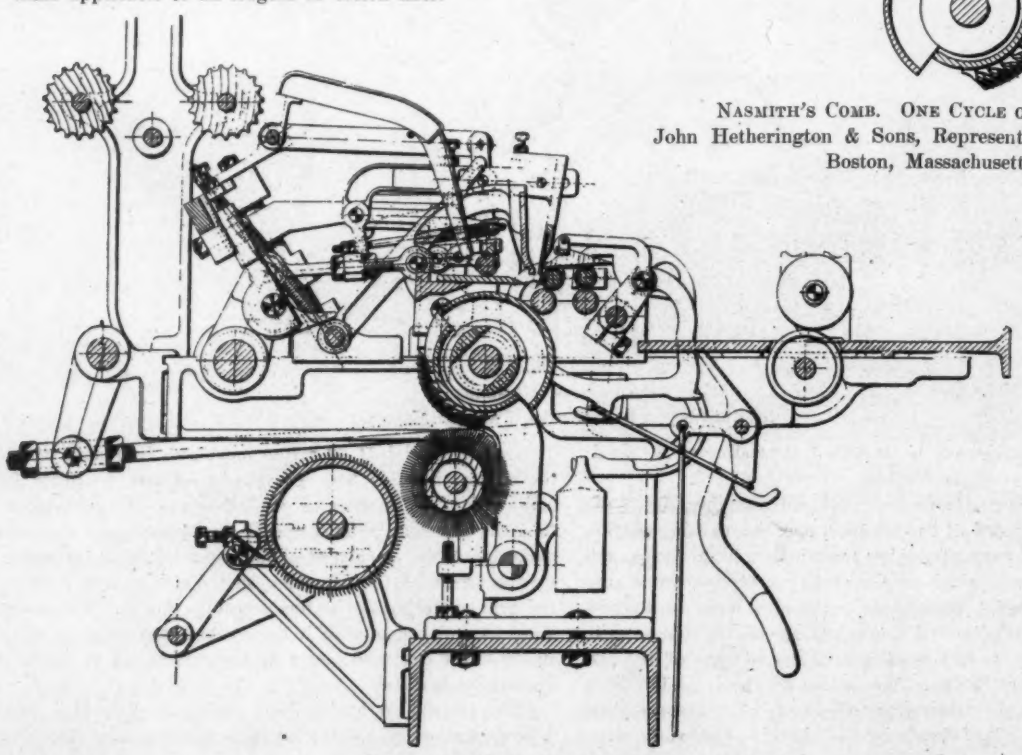
The Heilman combing machine was introduced to the cotton trade by John Hetherington & Sons in 1850. It is only effective when treating long cotton, therefore its use has been restricted to the finer branches of cotton spinning.

The designer and patentee of the Nasmith comber here shown has retained all the best points of the Heilman and greatly simplified its mechanical details, producing a machine applicable to all lengths of cotton fiber.

The advantages claimed for the Nasmith comber may be summarized as follows:—(a) Without increase of speed, twice the production of a Heilman comber can be obtained and the quality maintained; (b) will deal with all lengths of staple from ⅞ inch to 2 inches, without abnormal waste on the shorter varieties; (c) makes a perfect piecing with long over-lap even on the shortest cotton; (d) quantity of waste is easily controlled and if desired it will work with very low waste, even on short staple, for semi-combed yarns; (e) its motions, except those of the detaching rollers, are continuous, so that there is only one cam in the machine, which runs very quietly and with proportionately reduced wear and tear; and (f) its mechanism and adjustment are simple and rarely require resetting.



NASMITH'S COMB. ONE CYCLE OF OPERATION.
John Hetherington & Sons, Represented by S. C. Lowe, Boston, Massachusetts.



SECTION OF NASMITH'S COMBER.
John Hetherington & Sons, Represented by S. C. Lowe, Boston, Massachusetts.

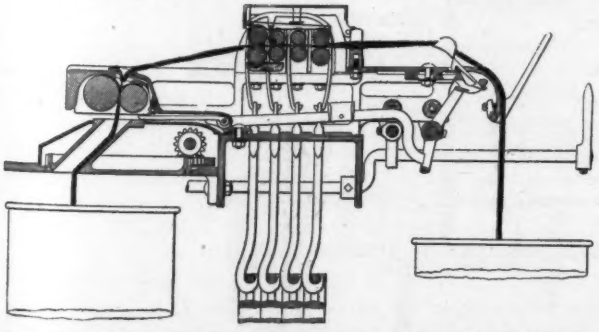
The position of the parts of the combing mechanism at the various points of the stroke is shown in the accompanying illustrations, representing one cycle of operations. A, B, C, shows the main organs in three positions. The first, Fig. A, shows the needles passing through the end of the lap, held down by the closed nipper, which is now in its rearward position (the dead point of the crank). Before the fine needles have passed, the nipper is already moving forward in the same direction as the cylinder, thus reducing the effective speed at which the needles are passing through the cotton and easing the strain on the fiber. In Fig. B the needles have passed and the nipper is about the middle of its path toward the detaching rollers. As the last row of needles passes under the detaching rollers, the latter turn backward and owing to the top roller leaning toward the cylinder, the end of the combed fleece thus delivered backward is projected into the space between the last row of needles and the plain segment whose front edge strokes the fleece close against and under the bottom roller, so as to present a clean surface to the advancing nipper tuft for piecing. Meantime the nipper having opened the lap end rises automatically and points directly towards the nip of the rollers. It would rise higher but is met by the falling top comb and kept in proper position. The detaching rollers now begin to turn forward and seize the tips of the fibers presented by the advancing nipper and pull the lap end into the top comb. The nipper continues to advance, but with diminishing speed, (approaching the dead point of the crank), thrusting the end of the lap gradually into the nip of the rollers, which successively seize fresh fibers and draw them off through the top comb. The top roller moves away before the advancing nipper and top comb, but is eventually overtaken by them as both the nipper and roller arrive at the end of their respective paths. The rollers continue their rotary movement an instant longer to commence the separation, which is completed by the withdrawal of the nipper and top comb, leaving a short combed end projecting from the rollers, and the process recommences.

DRAWING FRAME.

We show, herewith, a sectional elevation of a drawing frame in which the old cap bar is entirely dispensed with and the slides or adjustable bearings are made deep enough to receive both top and bottom lines of rolls. Top and bottom rolls thus move together when setting or spreading to suit the different lengths of staple.

The frame has a one piece head end gear stand, which enables the operator to remove all gears and rolls without disturbing the stand. This stand is planed perfectly true on both sides, and is bolted and doweled to the roller beam so as to make it practically integral with the beam, so that gears are changed or replaced on the stand with the certainty of their being in perfect alignment.

The calender roll is made from one solid piece of cold-rolled steel, necked down to form both middle and end bearings, and the gear teeth at the end of each section are cut into the solid steel. The front or top calender roll is also made from one piece of solid cold-rolled steel. The steel spoons are strong yet light, and can be readily closed or opened at the mouth, to suit any weight of sliver from 100 grains per yard to 30 grains or less, as may be required.

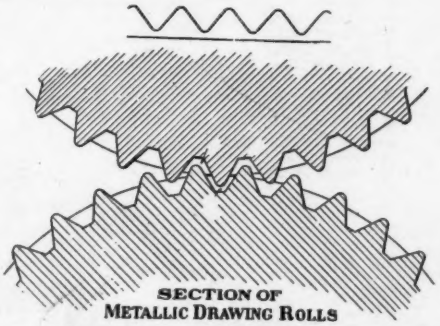


DRAWING FRAME. SECTIONAL ELEVATION. METALLIC ROLLS.
Saco & Pettee Machine Shops, Newton Upper Falls, Mass.

METALLIC ROLLS.

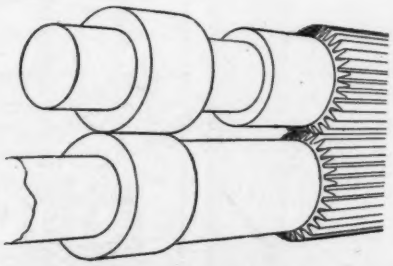
The metallic rolls which we here describe and illustrate have been known to cotton manufacturers, practically, for a number of years. These rolls are applied successfully on carding room machinery, as sliver lap and ribbon lap machines, comber draw box, coiler railway heads, drawing frames, slubbers and intermediate frames.

These rolls are perfectly made, being ground down to extreme accuracy in size, hence the machine starts with and maintains at all times a perfect roll, working without friction on collars. The bits of the roll is positive, and the draft direct and positive. The rolls running on collars without friction admit of sufficient space to allow perfect attenuation of the sliver, without injury. The licking up by reason of electricity and sticky weather is entirely overcome. The imperfect or "cut work" arising from imperfectly varnished rolls or dry rolls, because of lack of oil, is entirely eliminated.



SECTION OF METALLIC DRAWING ROLLS

—The straight line above indicates a sliver from leather rolls; the crimped line shows sliver from metallic rolls, and illustrates why metallic rolls deliver one-third more product.



Perspective view of rolls, showing collars in pure rolling contact, but so adjusted as to separate the gears while permitting them to interlock as shown in Fig. 1.

Metallic Drawing Roll Co., Indian Orchard, Massachusetts.

COTTON COMBING MACHINE.

The view herewith, of what is called a high-speed cotton combing machine is constructed to meet a popular demand for a combing machine capable of giving a maximum production with first quality of work. The mechanisms of this machine, such as the feeding, nipping, combing, detaching and piecing motions, are the same as any combing machine built on the Heilmann single nip principle. The principal modifications are in the actuating mechanisms of the various operations, whereby the same are adapted for safe and efficient operation at higher speeds than was possible in the older types. By means of these modifications the makers have eliminated the vibrations in the machine to a minimum, rendering it possible to increase the speed to 130 or 135 nips per minute with a corresponding increase in the productive capacity to 700 pounds per week on sea island and 1,000 pounds on coarse work.

The machine is built with eight heads to take laps 12 inches wide and 16 inches in diameter. All gearing and cams are machine-cut, thus ensuring smooth and practically noiseless running at high speeds. Twenty rows of needles are used on the half laps instead of seventeen, thus increasing the combing capacity nearly 18 per cent.

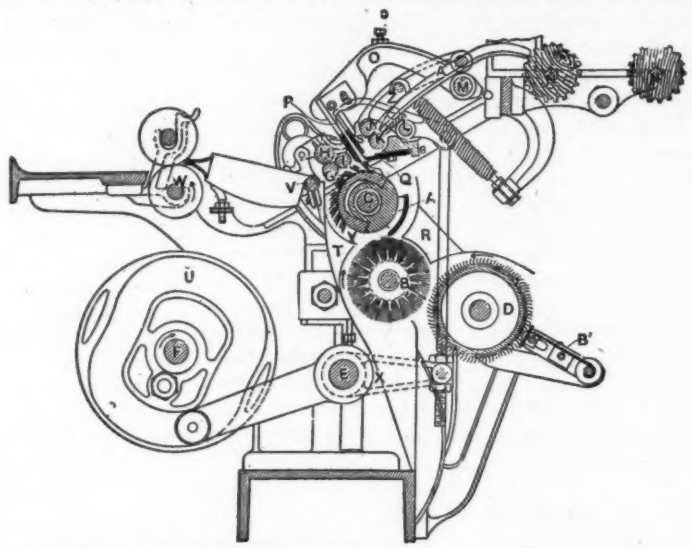
Electric stop motions of simple construction cover every point where there is likely to be a breakage of the sliver A tell-tale signal communicates the stoppage of the machine to the operator, thus reducing the care of the machine to a minimum, as it is impossible for the machine to continue in operation should the sliver break, a roller lap occur or coiler can become full.

The speed of the machine depends on the grade of stock used and the quality of the work desired. For average, from 125 to 135 nips per minute is recommended.

The degree of twist which is required to make the cohesion exceed the tensile strength depends naturally on the strength of the fiber. The mercerising process tends to shorten each individual fiber, and this shortening is resisted by tension in the direction parallel to the axis of the thread.

REFERENCES.

A—Fluted Segment.
B—Brush.
C—Cylinder.
D—Doffer.
E—Nipper Shaft.
F—Cam Shaft.
G—Steel Drawing off or Detaching Roll.
H—Brass Clearing Roll.
I—Leather Drawing-off Roll.
J—Top Feed Roll.
K—Bottom Feed Roll
L—Nipper Arm Fulcrum.
M—Top Comb Shaft.
N—Lap Roll Shaft.
O—Top Comb Arm.
P—Top Comb.
Q—Cushion Plate.
R—Doffer Cover.
S—Nipper Knife.
T—Waste Chute.
U—Nipper Cam.
V—Horse-Tail Holder Shaft.
W—Calender Roll Shaft.
X—Nipper Shaft Lever.
Y—Half Lap.
Z—Top Feed Roll Saddle.
A'—Lap Plate.
B'—Waste Packer.



SECTION OF HIGH SPEED COMBING MACHINE.
The Whitin Machine Works, Whitinsville, Massachusetts.

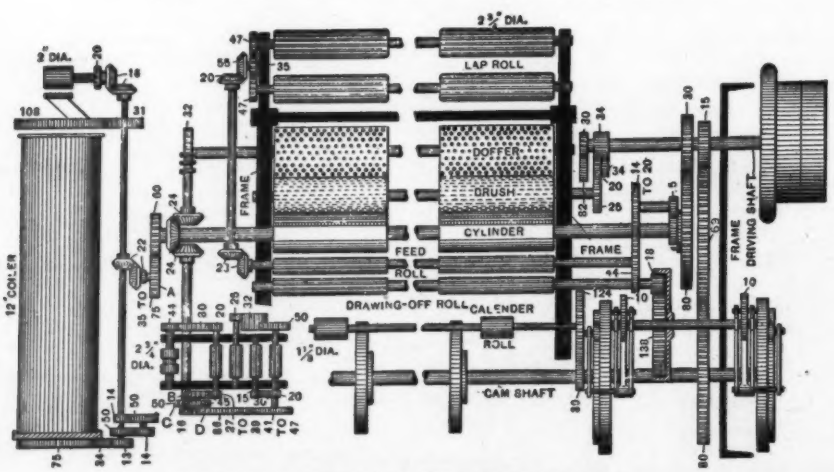


DIAGRAM OF GEARING OF HIGH SPEED COMBER.
The Whitin Machine Works, Whitinsville, Massachusetts.

DRAWING FRAME.

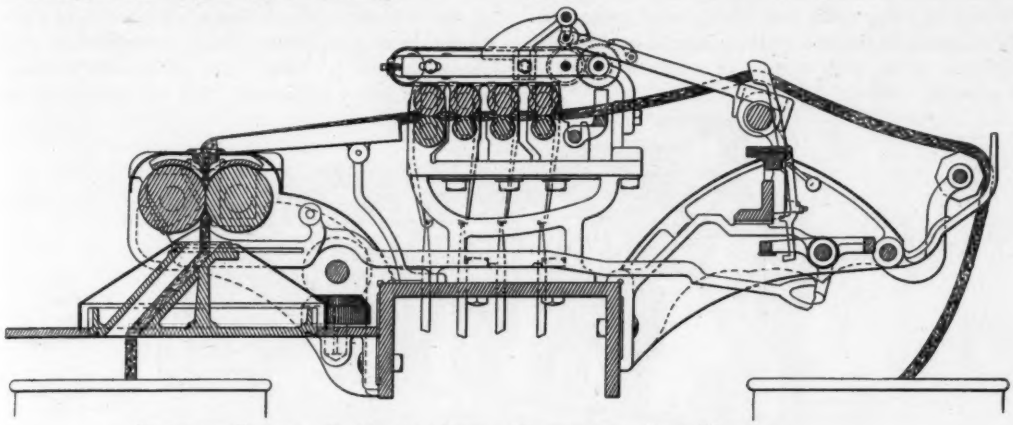
The drawing frames made by the Lowell Machine Shop are unusually substantial and of marked simplicity of design. They are built in the usual number of deliveries per head and can be coupled into frames of any length. The builders advise driving to an underneath shaft on frame and usually the speed of this shaft is the same as front roll speed. Shell top rolls, leather covered, are sometimes furnished, but almost invariably orders call for full metallic rolls. There are four lines of rolls which are dead weighted. The frame supports are adjustable for leveling.

rolls. The nose of this trumpet is adjustable as to distance to bite of calender rolls to take care of variation in length of staple and conditions of stock, etc.

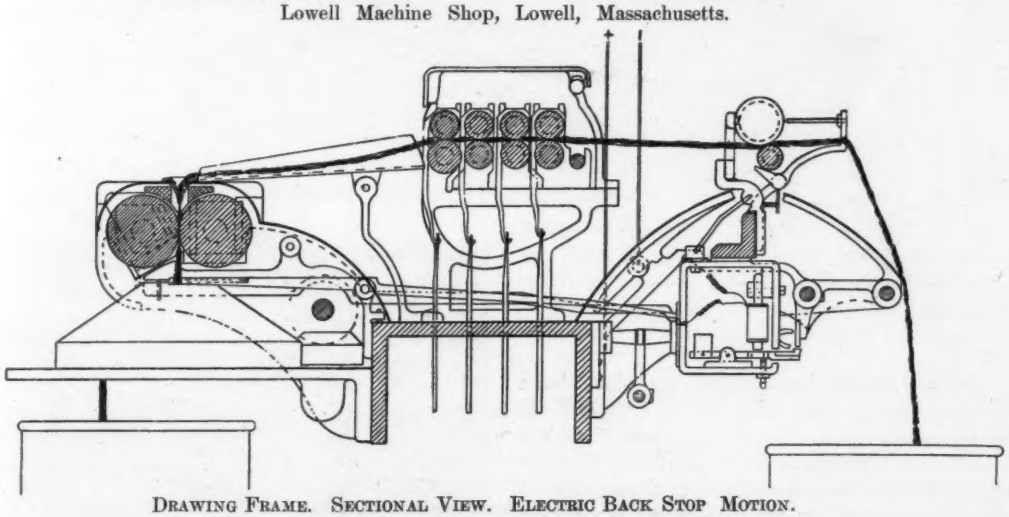
This drawing frame is free from parts which would interfere with rapid and effective cleaning. All working parts are neatly covered by formed steel polished covers.

Coilers are provided for 10-inch, 12-inch or 14-inch cans, as wanted.

The ease of operation, simplicity of design and general merits of the frame appeals most favorably to manufacturers.



DRAWING FRAME. SECTIONAL VIEW. MECHANICAL STOP MOTION.
Lowell Machine Shop, Lowell, Massachusetts.



DRAWING FRAME. SECTIONAL VIEW. ELECTRIC BACK STOP MOTION.
Lowell Machine Shop, Lowell, Massachusetts.

The stop motions are entirely effective and usually consist of a back, front and can stop motion, the latter acting when can is full and can be arranged to act independently. When it is desired a stop motion is applied to stop frame when a certain yardage of sliver is delivered in cans. The builders recommend full mechanical stop motions instead of electrical, especially on their frames, as their back stop motion spoons used on the mechanical stop motion drawing, are adjustable to prevent any light sliver from card after stripping, from entering work, or to provide for a change in weight of sliver without making it necessary to file spoons, etc., to change the weight. This extremely sensitive adjustment is followed by another valuable one of particular value, i. e., the adjustable trumpet over calender

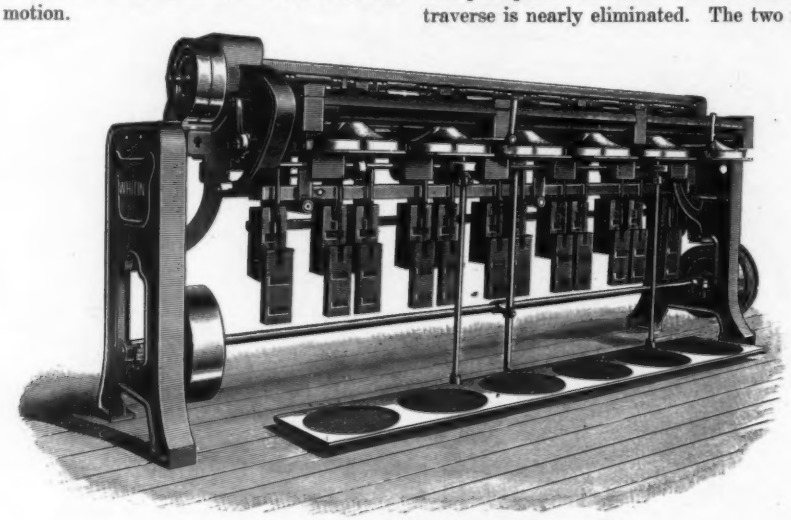
PRESERVATION OF HYDROGEN PEROXIDE.

A French chemist claims that peroxide of hydrogen solution will keep well if mixed with certain organic salts such as acetates and succinates, or even with trisodic phosphates. For a three per cent. peroxide solution to be used in wool-bleaching the addition of ten per cent. of acetate of soda is sufficient.

Short-stapled cotton lusters badly in mercerising, because it must be more tightly twisted. The best luster of all is obtained with two-fold twist, in which the outer fibers lie parallel to the axis, and the yarn should be well singed to remove projecting fibers.

DRAWING FRAME.

The accompanying illustration shows a coiler drawing frame, the coilers and can tables being made for 10-inch, 11-inch and 12-inch cans. The drawing rolls, all of crucible steel, are in four lines, 16 inches in length from center to center of stands, and made for all slivers to run on a single boss for each delivery. The bottom front roll is 1 3-8 inch in diameter, the back and middle rolls are 1 1-8 inch in diameter. Roll bearing stands are provided with brass steps which are easily renewed when worn out. The top rolls are made with loose end bearings which possess the advantage of being easily and quickly oiled without the necessity of removing the rolls or stopping the machine. Direct weighting of top rolls is used in connection with an efficient relieving motion.



Coiler Drawing Frame (Front).
The Whitin Machine Works, Whitinsville, Massachusetts.

The calender rolls are made of steel, three inches in diameter and 26 inches long, the driving calender roll runs in fixed bearings, while the outer calender roll bearings are movable in inclined bearing seats, by means of which the weight of the roll effects a thorough condensation of the sliver.

The draft gear is easily and quickly changed by means of a swivel adjusting stand, which is always concentric with the front roll gear. The draft between front and calender rolls may be varied to a very small degree to suit the stock and weather changes by the use of compensating gears of large diameters for which purpose change gears are provided.

Stop motions are mechanical throughout, and consist of back, front, and full-can motions. All are simple and effective in action and are not likely to get out of order. A full can stop-motion is operated by a slight pressure of the cotton on the face plate of the coiler when the can becomes filled, a feature to be appreciated, as the cans are never overfilled, nor is the cotton so closely packed into the can as to injure its quality in subsequent operations.

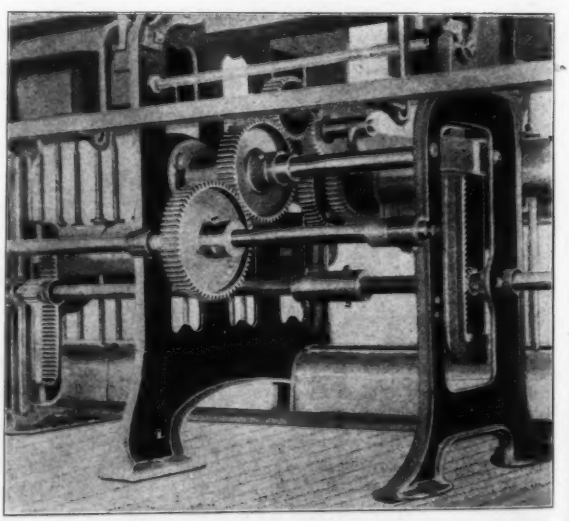
Can tables are so arranged as to hold cans 36 inches high without the necessity of cutting into the floor.

All gearing is thoroughly guarded with covers, which act in conjunction with an automatic locking device of the driving belt. Liability to accidents while oiling and cleaning the machine when in motion, is prevented by the use of this device, for it is impossible to open any of the covers without first stopping the machine, and it is also impossible to start the machine in motion with any of the covers open.

A ROVING FRAME.

By the peculiar construction of the self-balanced rail we have in the accompanying illustration a roving frame extended in length so as to contain two sections, equal to nearly twice the quantity of work, yet said to require less than one half the power per spindle.

One attendant can, on almost all varieties of work operate the longer machines making a considerable saving in cost per spindle for labor. The dwell at the changes of the traverse is nearly eliminated. The two rails being each balanced by the other and the direction of force applied to the rails through the pinion gears always tending to support the rail, no back lash is in evidence, no matter how worn the shafts, boxes or gears may become. The elimination of the



Center Head, Speeder Self-Balanced Rails.
Providence Machine Company, Providence R. I.

back lash causes the machine to build a more perfect nose or taper upon the bobbin, with less liability of strained and uneven yarn, flushed over or soft nosed bobbins which cause waste and bunches. The machine is from 800 to 1200 pounds lighter owing to the absence of rail attachments and balance weights. The gearing is less liable to breakage as the power is divided between the two sections, they having separate driving gears, thus the gears have to do only one half the work required of them in the old style machine. Owing to the balance weights being removed, the creel can be started nearer the floor so that in machines using large bobbins in the creel they are within reach of the small help in the mill. As the rails with their load of bobbins are balanced by each other and not by iron wieghts, the load of each rail increases at the same speed, so the rails are always in balance.

The cleaning of the machine is easily done owing to the absence of the weights, chains, studs and pulleys which collect a very considerable quantity of fly and waste. The use of polished steel casings and clearer covers also adds to the ease with which the machine is cleaned as there are no flanges or panels to obstruct the wiping. The parts requiring oil are for the most part grouped at the head and center of the frame.

ROVING FRAME.

The roving frame here illustrated is of superior construction and finish. It has an improved method of tightening the cone belt doing away with cutting, piecing or taking up. When slack, the belt may be tightened in a few moments by means of a quadrant bracket. Over five inches of stretch can be taken care of without re-piecing. Its system of balancing the top or bobbin rail entirely prevents the long bolsters or collars from tilting forward, even after years of work. The slides are relieved from all friction and consequent wear. This prevents vibration of the top rails, spindles and flyers, and the bad work resulting therefrom.

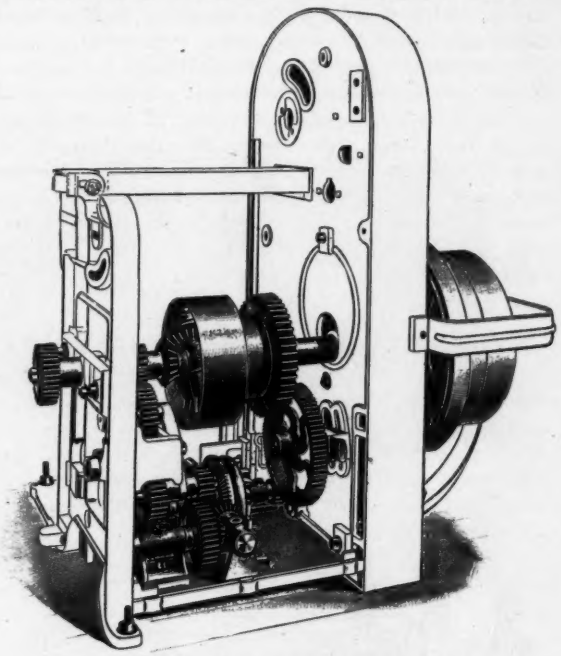
The driving ends of bobbin and spindle shafts are case hardened, and are in short lengths, so that they can be easily taken out even when the frame is placed end to end with others in narrow passages.

The differential motion in this frame requires comparatively little power, not subject to much wear and tear, and gives accurate winding. The gears of this motion which are on the jack shaft, revolve in the same direction as the shaft.

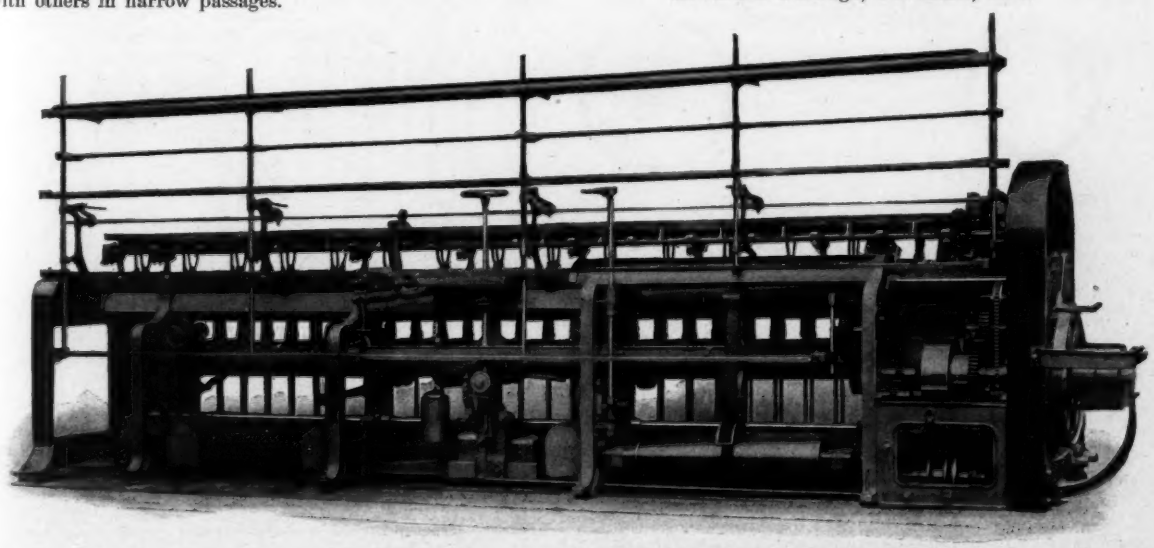
A new arrangement of cone drums gives all the advantage of swinging cones without any of their evils. Both ends of the cone are raised or lowered together from the front of the machine.

The full bobbin stop motion is very effective in its action. The frame cannot be started after the completion of a set until doffing has taken place and the rack has been wound back.

The reversing or let-off motion entirely prevents the rov-



GEARING FOR ROVING FRAME.
Howard & Bullough, Pawtucket, R. I.



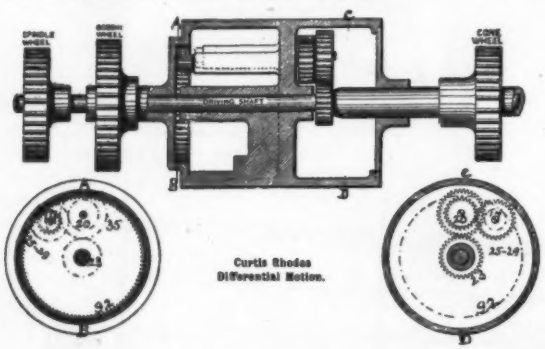
ROVING FRAME. Howard & Bullough, Pawtucket, R. I.

ing running over the end on the changes, as the speed of the bobbin changes simultaneously with the change in the lifting rail, thus overcoming the liability of stretching the roving and entirely preventing bad bobbin ends.

To afford every facility for effecting the changes in the motion wheels controlling the lift, the makers have rearranged the parts connected therewith, and have provided two change places instead of one, as hitherto. Formerly it was the practice to make the change by altering the wheel on the end of the reversing shaft; but as this course was considered inconvenient and somewhat limited in range, they have introduced two additional wheels one of which is mounted upon a stud carried by an adjustable quadrant bracket. This latter is the additional change wheel, and can be readily replaced by one containing more or fewer teeth, as circumstances may require. To effect this object, they have placed the short shaft, carrying the bevel wheels horizontally, instead of vertically, and connected the gearing in the manner shown herewith. In addition to providing two change places for the lift, this alteration has also enabled the makers to dispense with a back cross rail, thus allowing free access to the main gearing. Another advantage of this arrangement is that it dispenses with the necessity of altering the bevel wheel, gearing with the reversing wheels.

DIFFERENTIAL MOTION ON A ROVING FRAME.

With this we illustrate a differential motion known as the Curtis-Rhodes motion, in which the winding has been an object of very special study. In addition to a large, long, quick running, and perfectly formed cone, the position of the driving shaft in relation to the rail has been carefully considered, so that the motion of the rail does not cause an independent motion of the bobbins.



John Hetherington & Sons, Represented by S. C. Lowe, Boston, Massachusetts.

The following explanation will be understood on reference to it. The central casing *CD*, which is carefully balanced when running, is fast to the shaft, and carries the bosses of the two compound wheels. The internal wheel, to which is attached the bobbin wheel, runs loose on the shaft, as does also the cone wheel at the right hand. The latter carries a 23 pinion inside the box, gearing with the 35 of the compound 35/20, the 20 gears with another pinion usually 23 teeth on the same stud as the 14, which gears with the 92 internal wheel fixed to the bobbin driver. If now the cone wheel runs at the same speed as the shaft, the bobbin wheel would make the same number of turns as the shaft and spindle wheel, but if the cone wheel runs a little quicker than the shaft it will cause the bobbin wheel through the intermediate gear also to run a little quicker and in the following ratio.

Suppose A= the speed of the shaft, and n= that of the cone wheel, n being greater than A. The excess of speed of n over A will be represented by the expression $(n-A)$. Then the number of turns of the bobbin wheel for A turns of the shaft will be

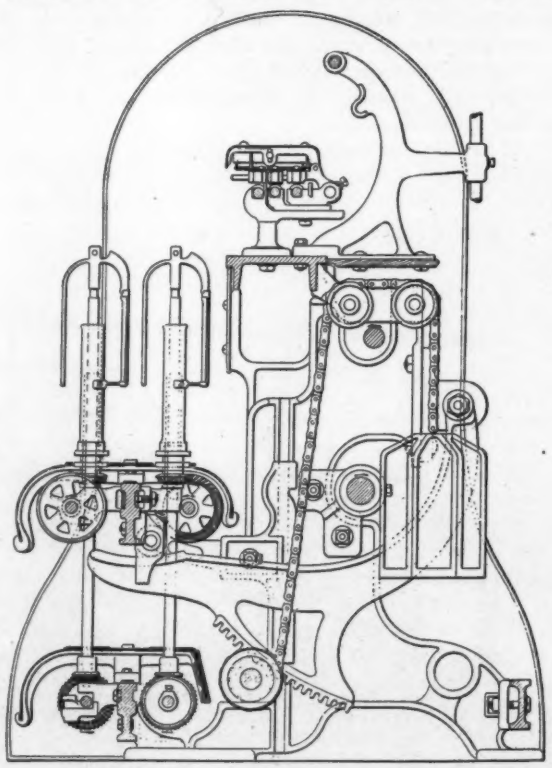
$$N = A + \frac{(n-A)\times 23\times 20\times 14}{35\times 23\times 92} \text{ whence } N = A + \frac{2(n-A)}{23}$$

The advantage of this motion is said to be that all the parts run in the same direction as the shaft, and at only a slightly different speed, whilst the inside pinions run very slowly indeed on their axes, so that the wear and tear and the noise are greatly reduced. The bobbins derive the greater part of their speed from the shaft, and only the excess of speed of the bobbin over the flyer is derived from the cone, and that through a very slow running and consequently powerful mechanism, the work of the cone strap is greatly reduced and the winding proportionately better.

ROVING FRAME.

The roving frame which we illustrate herewith was formerly known as the "Biddeford Frame," and is regarded by manufacturers as one of the best roving frames upon the market. This machine has always been commended for the ease and readiness by which all parts can be reached and adjusted.

The frame has a stiff lifting shaft, supported by bearings close to each lifting pinion; also at every samson. This shaft runs the whole length, and is driven from the center of the frame, thereby diminishing the torsion; pinions on this shaft engage with a segment lifting arm;



Roving Frame. Lifting Arrangement.
Saco & Pettee Machine Shops, Newton Upper Falls, Mass.

a suitably curved extension of this arm supports a carrier truck, which is held near the center of gravity of the rail, thereby overcoming all tendency of binding, either of the connecting arms against the slides, or of the bolsters and spindles—the object being to have the lift nearly under the center of the load, resulting in having a steady and easy movement of the rail.

The rack for moving the cone belt is driven by a worm on the vertical shaft, which is so connected with this shaft that no movement is given to the rack until the vertical shaft has made a quarter of a revolution; then the crown bevel on the upright shaft is in gear with a pinion on the end of the top cone shaft, thereby giving a positive and quick movement to the rack, and driving the same only by this positive action of the gears, the spring simply starting the upright shaft until these gears are connected. A stop motion is applied for stopping the frame when a set is full, and is so arranged that the rail can be stopped either in its upward or downward movement, at any desired point. The traverse motion gives a variable traverse and prevents the dwell at the same spot on the top roll at the ends of the stroke. This gives a uniform wear to the top rolls.

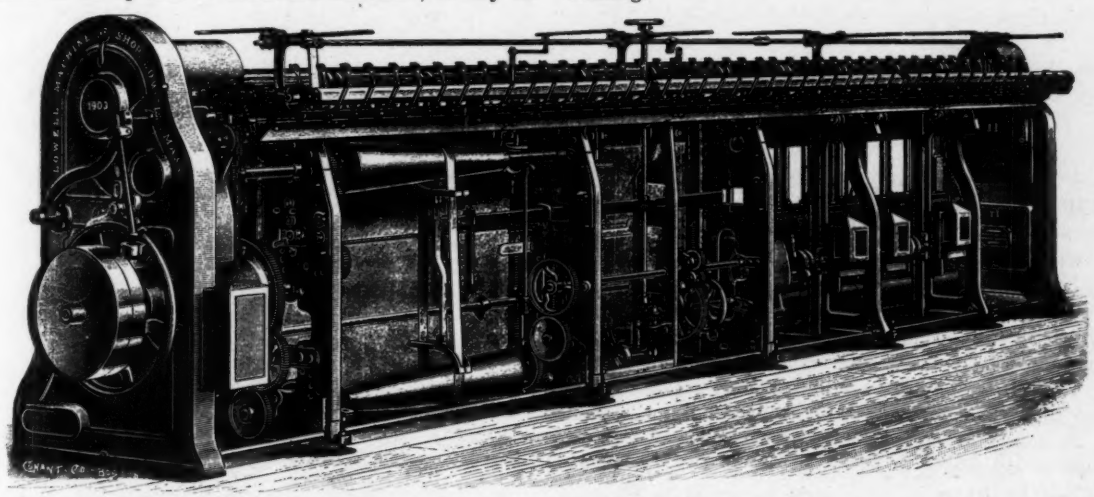
FLY FRAME.

The machine here illustrated represents an advance in construction of probably the most interesting machine from a mechanical standpoint, found in a cotton mill.

The builders of the frame have successfully applied their principle of heavy structural work with carefully designed running parts of high class material and workmanship, to effect the highest production within a reasonable lifetime of the machine and with minimum repairs.

The feet of frame have jack screw foot adjustment, and main driving pulleys are provided with outboard bearings.

The underwork of the frame is enclosed to a point beyond the last section containing gears. This enclosing is accomplished by removable doors in rear and a sheet steel curtain in front. The keeping of sweepings, flyings, dirt, etc., from running gears, bearings, etc., insure greater ease of operation and fewer breakdowns from improper cleaning.



FLY FRAME.
Lowell Machine Shop, Lowell, Massachusetts.

DRAWING FRAME.

Dobson & Barlow, Bolton, England, build their drawing frames with back spoon stop motion to stop the frame when the cans run empty or when a sliver breaks, but none of the motions are controlled by electricity, hence there are no dynamos or batteries.

This machine has a double action front stop motion to prevent roller laps, and to stop the machine if the sliver is too heavy or too light, and to prevent lumps, flat waste, or uneven sliver passing into the cans.

It has weight relieving motion to take the weight off the rollers when the frame is stopped, thus preventing flat places being made on the leather covered rollers, and a back, roller motion to prevent singles, which is a feature and renders singles an impossibility.

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The builder motion is of the bevel type, the simplest in form and the most durable. Outriggers, design of gears and changes in proportions have eliminated the troubles usually experienced with compounds.

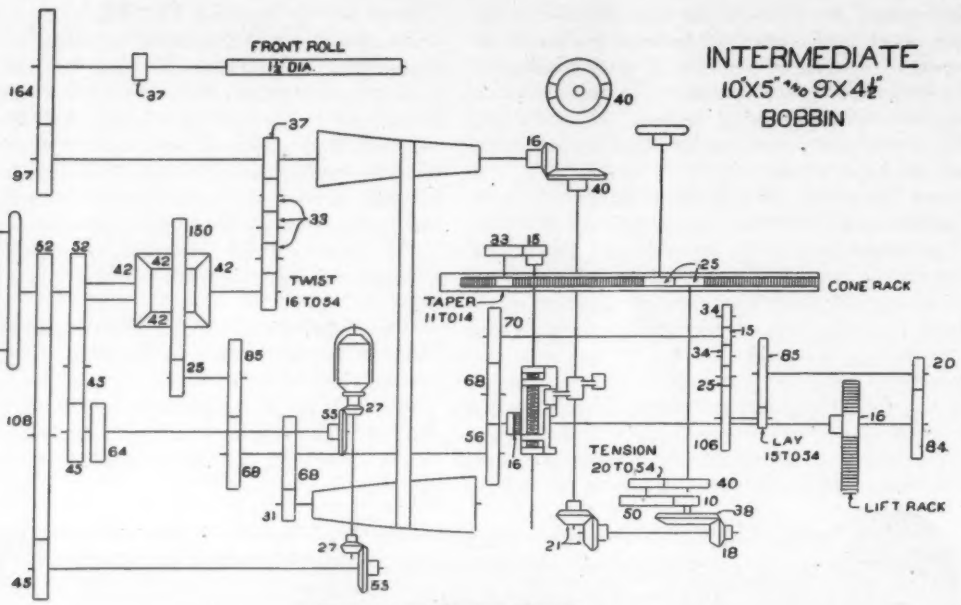
The taper motion is of the sliding jaw type, the slides being on an independent guide rod which is operated by a gear on lifting shaft. This fly frame is the pioneer in the use of a center lifting for the traverse of the bolster rail which is meeting with general favor.

There are three lines of rolls, the middle and back top rolls are solid and the front shell. The bottom rolls are steel fluted. Self-weighted top rolls with revolving clearers are furnished on jack frames for special work. The rolls are geared on both ends.

On slubbers there is furnished, when desired, an adjustable back stop motion in addition to the regular sliver lifting roll. There is also applied to all frames a stop motion to act when bobbins are full and shipper gag to avoid starting frame except under proper conditions.

The step, rail and roll covers are made of formed polished steel.

The bolsters of these frames are a new departure in that they are made of drawn tube steel instead of cast iron.



GEARING OF ROVING FRAME.
Lowell Machine Shop, Lowell, Massachusetts.

They are firmly set on a substantially designed bracket which is fitted to bolster rail by a milled joint and is further secured by a screw.

The creels are rigid in construction and will be provided with well formed steel bobbin troughs for holding empty bobbins and pushing same to bobbin boxes when requested by mills, avoiding the unsightly home-made troughs usually applied.

The ends of the rails are protected by a guard to prevent trucks from striking same.

Spindle steps have large bearings with oil reservoir ample in capacity.

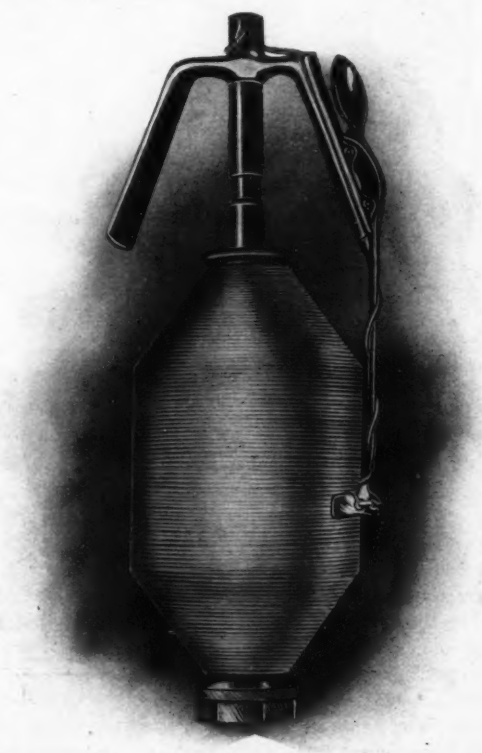
This fly frame is particularly successful in giving a large production and running with few repairs.

THE DUNN FLYER.

One of the most, if not the most important part upon the roving frame, is the flyer, and a short sketch of its history may not be out of place.

The flyers upon Arkwright's original machine in 1769, were made of wood, with small wires on the side which led the thread to the bobbin; the arms were solid and without pressers. These flyers were not adapted to the spinning of roving but were for warp yarn. Arkwright, on his roving frame, allowed his roving to be deposited in revolving cans which supplied the necessary twist. About the year 1817 the fly frame was introduced for preparing roving for the middle and coarser numbers of both warp and weft. Instead of the revolving cans of the roving frame, the fly frame had spindles placed at equal distances from each other, with a flyer on the top of each; the flyer had two arms, one of which was made into the form of a tube for the purpose of receiving the roving and conveying it to the bobbin.

About the year 1820 the presser, or presser finger, was applied to the flyer, which by its action compressed the material upon the bobbin upon which it was being wound, thus enabling a much larger quantity to be put upon them than would otherwise have been the case. Before the application of these, the bobbins were filled very quickly, and the operation of doffing was necessary three or four times, while as now made once is quite sufficient. Formerly the bobbins had flanged heads in order to retain the roving upon the barrel, but these were long ago dispensed with.



DUNN FLYER.
Textile Machinery Company, Boston, Massachusetts.

With the roving as it is now wound upon the bobbin, being coned at both extremities, the presser forms a guide which enables the winding to be done in conjunction with the action of the taper motion on the frame.

Since the introduction of the presser upon flyers, a great deal of thought and study has been applied to the perfection of them, and over three hundred patents have been allowed on this device alone, each inventor, in most cases, striving to equalize the pressure on the roving as it is wound upon the bobbin. The action of the presser has been confined to centrifugal force and springs, with the main thought to reduce the friction at the bearings of the presser, so as to get the full benefit of the centrifugal force.

The presser has always been hung upon the hollow or tube arm in a vertical position, thus making it swing around a vertical axis. No radical change was made in the form or principle of flyers until 1894, when Thomas F. Dunn conceived the idea of cutting the arms off half the length and hanging the presser upon a horizontal axis, and in such a manner as to form a continuation of the hollow arm. This resulted in allowing a larger diameter of bobbin to be made in the same space, and at the same time laying the roving more compactly, making a gain of 25 per cent. for an average per bobbin. This was done without any injury to the roving whatever, extra consumption of power or straining of the roving frames.

It will be noticed from the accompanying illustration of the Dunn flyer, so called, that in the presser foot there are two eyes so positioned as to apply the proper friction or snubbing, or the winding of a firm bobbin, all inside of the length of the staple, and close to the bobbin.

It is known by all carders and practical cotton mill men that the figured twist is never obtained in the roving unless excessive twist is run; the strand passing down the long tube and across the presser, is subjected to a stretch that reduces the turns per inch.

It is claimed to have been found that roving made with the Dunn flyer upon the same frame, therefore with same twist gear, as the present form of flyer, retains more twist which amounts, it is said, almost invariably to one tooth, and with some stock and under some conditions to two teeth. This allows, when a full frame of Dunn flyers are being run, to put a larger twist gear, which spreads up the front roll four or five turns per minute, without any increase in speed of the spindles, and still have the same twist in the roving as is being obtained with the old flyer. This is quite noticeable when running 5, 6 or 7-hank on a 7 x 3 1-2 flyer.

And speaking of numbers recalls another feature of the Dunn flyer, viz., that fine as well as coarse roving can be run on the same flyer, as the tube is short and straight, with the slot cut in front, so that it is impossible for the strand to fly out even if slack. After leaving the short tube it winds spirally around the presser arm, with the twist, so that it gets proper support without strain, and is delivered directly to the bobbin. A range of from two to twelve hanks has been established upon a 7 x 3 1-2 size flyer.

No lint or slugs can catch in the tube or slot, and a large percentage of foreign matter is thrown off in the passage of the strand down the presser arm, thus obtaining a cleaner roving. This flyer is strongly built, with special tolls and jigs, thus assuring perfect duplication. It is a light yet stiff flyer, and from its form it is said to be impossible for it to get out of balance, and that it can be run at any speed without spreading of the arms or working off the top of the spindle.

COTTON MANUFACTURING

PROCESSES IN COTTON MANUFACTURING.

OPENING. MIXING. COTTON OF DIFFERENT LENGTHS OF STAPLE SHOULD NOT BE MIXED. MACHINERY SHOULD BE CAREFULLY ADJUSTED. THE TWO AND THREE BLADE BEATER PICKERS. THE GRID BARS. THE PICKER FAN. SPLIT LAPS.

BY CHARLES E. BARNHARDT.

The first process that cotton is subjected to on its arrival at the mill, and the one which is the beginning of its manufacture into yarn or cloth, is that of opening and mixing the cotton from the different bales. This may be considered a very simple process, and in many cases it is not given the attention that it should have, but it is always one of great importance. When even running grades of cotton are used the mixing does not require such close attention as when the stock is of different grades. It is always desirable that as large a mixing as is possible be made at one time, so the air can circulate through the pile for a greater length of time causing the cotton to be loosened up, and allowing the fibers to regain, to some extent, their natural position, since this will insure more regular spinning and produce a nicer and more uniform yarn.

In the modern equipped mill the bale breaker is largely used, its principal object being to tear up the matted layers of cotton which have been so closely packed in baling and compressing, and at the same time remove much of the sand, broken seed and other heavy impurities always found in cotton. In operating the bale breaker the bales of cotton to be mixed should be opened as near to the machine as possible, and successive layers from different bales placed on the feed apron of the machine, which will insure a more even mixing of the various grades of cotton in the lot. The stock is delivered by this machine upon an apron which in turn carries it to the mixing pile, or direct to the feed hopper of the picker as the case may be. In some mills the bale breaker is located in the cotton warehouse, the stock after passing through this machine being drawn to the mixing room or picker room through a flue by means of a fan.

However, in most mills the cotton is opened and mixed by hand, and if proper care be taken the results are equally as good as when the bale breaker is used. In mixing the cotton by hand, the first bale should be thoroughly torn to pieces and evenly distributed over the floor of the mixing room, the second bale in like manner spread over the first and this operation continued until the required number of bales have been opened. In taking cotton from this pile to feed into the hopper of the opener it should be started

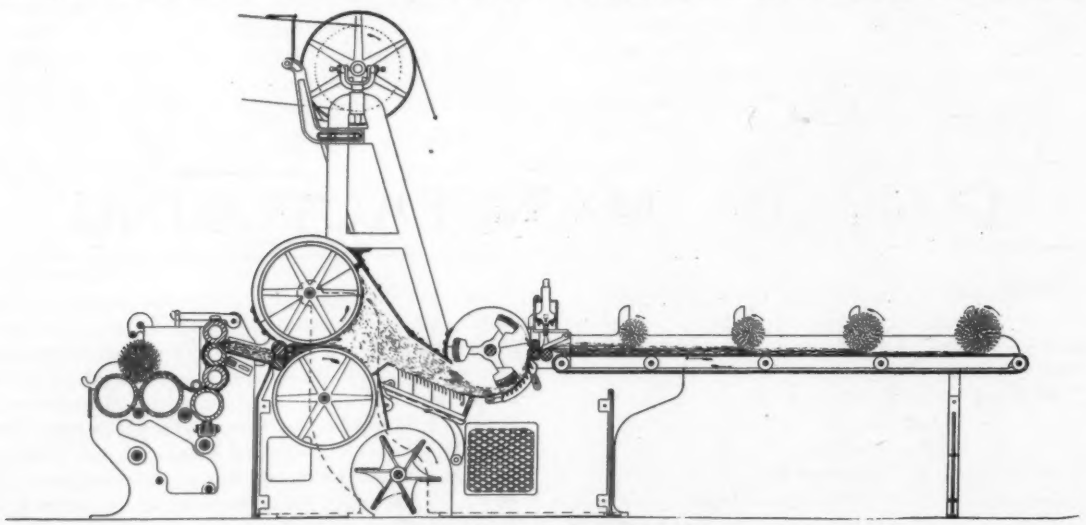
from one end of the mixing and taken from top to bottom of the pile as near as possible, so as to get a layer of each of the bales in the mixing in one armful, and in this manner a greater uniformity can be obtained. Another method in quite general use, and one by which good results are also obtained, is that of opening bales side by side, a layer being taken from each bale in succession and distributed as nearly even as possible over the pile. In this case less care is required in feeding the stock into the opener, as it is not so important that each armful be taken from top to bottom of the pile.

The best results are always obtained when cottons of the same character, color, and length of staple are mixed together, but in many cases, for commercial reasons, it is necessary that different grades be worked together. If the character of the fiber and the length of the staple are approximately the same, the color can be made to run uniformly by a careful mixing. It is folly, however, to mix cottons of any material difference in length of staple and expect good running work on the machines through which it passes. In carding, a great many of the short fibers will be separated from the long, thus making an undue amount of strippings and fly, while at the drawing frame the rollers can not be adjusted to the long and short fibers at the same time, for if the rolls are set for the short fibers the long ones are strained or broken, and if set for the long fibers a great many of the short ones fly out, thus making the stock light, and in addition to making this waste will produce an irregular and in most cases a cockled yarn.

stock in the very best manner for the action of the picker, and at the same time provides an even and regular feed for the machine, which is very essential for the production of an even lap. In addition to this, the heavy foreign objects such as nails, buckles, etc., which are often carelessly thrown into the mixing pile, are removed, and the danger of fire in the picker room diminished.

Picking machinery is the heaviest that is used in connection with the manufacture of cotton yarns and cloth, and as its beaters and fans revolve at a very high rate of speed, it is highly essential that extreme care be taken to see that it is properly leveled and the revolving shafts adjusted so that they will run without heating. When the machine is not level it will be noticed that there is considerable jar and vibration in the running of it. The beater will run with much jumping and vibration, and frequent oiling is required to keep the beater and fan bearings from heating. When this is the case the machine will not turn out the quality of work that it should, from the fact that the beater is not acting evenly upon the stock as it is delivered to it by the feed rollers. The action of the beater, undoubtedly, does some injury to the staple at every blow. However, this is an insignificant matter when the good effects resulting from this operation are taken into consideration.

The principal object to be kept in mind in the operation of picking machinery is to keep the machines adjusted in such a manner that they will free the cotton from dirt, seeds, etc., thus furnishing a superior lap for the card, and preventing the substances thus removed from coming in



A Kitson One-Beater Finisher.

The waste made in the card room which is of such a character as will permit its being reworked is returned to the opening room and should be thoroughly mixed with the bales of cotton being opened, or small quantities of it thrown into the hopper of the picker at intervals. In some mills the card strippings are continuously reworked in this manner.

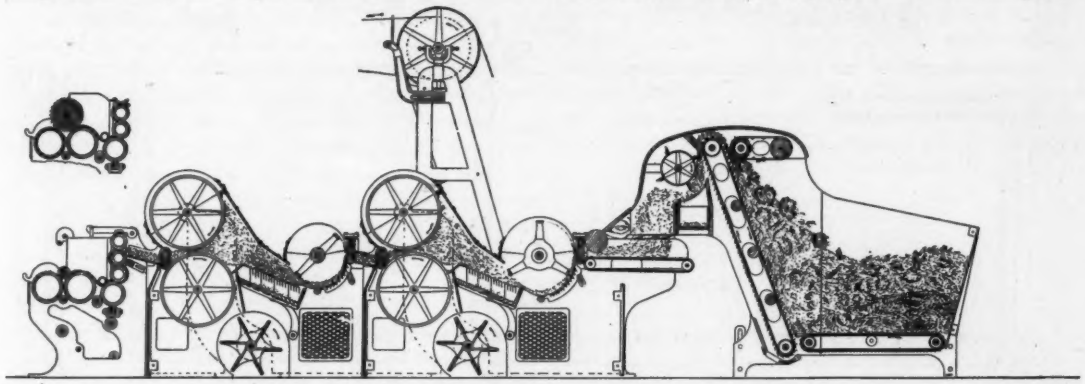
The automatic feeder and preparer, or hopper feed, as is generally used in connection with the picker, is the first machine to which the cotton is subjected after being mixed. The value of the hopper in comparison with the practice of feeding by hand can scarcely be overestimated. It tears up the matted lumps of cotton, thus permitting the fibers to regain their original fluffy condition, and prepares the

contact with the card clothing, which if they were allowed to do would take the point off the card wire, and a great many of the particles would remain in the stock causing trouble in the subsequent processes, in addition to making an inferior grade of yarn.

From the picker, the stock is usually taken to the breaker lapper through a cleaning trunk by means of a fan. The cleaning trunk is arranged in a horizontal position, or if the lapper room is located on the floor above the mixing room, as is frequently the case, the trunk is run through the floor of the lapper room and connected with the breaker in an inclined position. The bottom of the trunk is provided with a series of grid bars over which the stock passes, and many of the small impurities in the cotton fall into a

receptacle underneath the grids provided for this purpose.

The construction and operation of the breaker lapper is very much the same as that of the picker, the object being to continue the cleaning of the stock and forming it into a lap for the next process of scutching. Three processes of scutching are in general use in addition to the picker, the construction and operation of these machines being similar to each other. The intermediate and finisher scutchers, or lappers, are the same in construction, and in many cases the intermediate lapper is not used, the lap being run through the finisher until it is of the required weight. One of the principal objects to be kept in mind after the stock has left the breaker lapper is to produce an even and uniform product from each subsequent operation, and for this reason we have as many doublings as are practicable on the various machines. On the intermediate and finisher lappers we usually find a doubling of four into one, the lap delivered from the machine usually being a little lighter in weight than any one fed to it, thus it will be seen that the draft of these machines is usually slightly more than four, or a little more than the number of laps placed on the feed apron. In addition to the doublings on the feed apron, the evening mechanism which regulates the feed of the intermediate and finisher lapper is found to be a very valuable adjunct in the formation of an even lap. The bearings and other working parts of this device should be kept clean and well oiled in order that it may properly perform the object for which it is intended.



A Kitson Two-Beater Breaker Lapper with Automatic Feeder.

The breaker lapper is usually provided with two beaters, while the intermediate and finished more often have only one each. There are several kinds of beaters in use in connection with lappers, and doubtless each style has some advantages peculiar to itself. The two- or three-blade beater is usually found in use in the breaker and intermediate, while the finisher is more frequently equipped with the carding beater. The two-blade beater is in most cases preferable to the three blade, as it is more evenly balanced and can be run at a higher speed, with less vibration, than the three blade. The edges of the blade beaters are usually made of hardened steel, and should be kept sharp and ground to the proper bevel. Both ends of the beater shaft are alike, so when the edge in use becomes dulled the shaft can be reversed and the other edge brought into use.

The distance at which the beater blades should be set from the feed rollers depends entirely on the character of the cotton being worked. In most cases it should be about one quarter of an inch. The speed of the two-blade beater is 1200 to 1500 revolutions per minute, while the three-blade, on account of having the additional wing, is run at about one-third less speed. The two-blade beater is usually preferable to the three-blade one, from the fact that it is more perfectly balanced, and by running at a higher speed it strikes the cotton at the feed rollers a sharper and more steady blow, while the action of the three-blade beater is less quick and as good results can not be obtained. The wood faces on the three arms of the carding beater are provided with a number of sharp, tempered steel pins which project in such a manner that each row is further from the circle than the preceding one. Thus it can be seen that this beater will tend to comb and straighten out the fibers, in addition to its cleaning properties, and permit the card to take off a larger amount of work and better in quality, because of the better preparation of the stock.

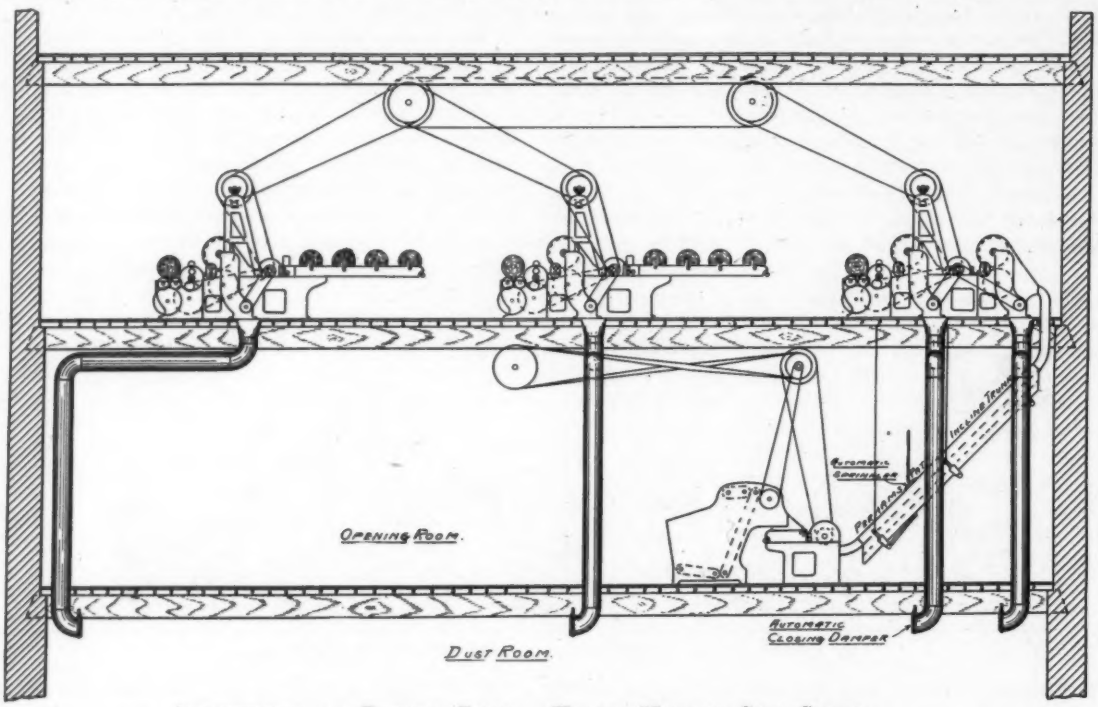
The care and adjustment of the grid-bars is a matter of considerable importance, since the good effects of the beater can be very much reduced if the grids are not attended to. The grid bars extend about one fourth the distance of the circumference of the revolution of the beater, the space between the bars varying from 5/16 of an inch nearest to the feed rollers, to ¼ of an inch at the other end. The blades of the beater strike the cotton as it is delivered from the feed rollers, carrying it down over the grids with such force that most of the sand, leaf and other substances fall between the bars into a receptacle underneath. The bars are supported by adjustable brackets, and should be set so that the distance between the bars and beater is less at the end just below the feed rolls, gradually increasing toward the other end in order to accommodate the cotton as it increases in bulk on becoming more thoroughly opened. The exact distance that the grid bars should be set from the beater can not be correctly given, since this depends entirely on the quality of the stock being worked. However it is usually from one quarter to one half an inch. The upper edges of the bars should be kept sharp and clean, so that the cotton in being dashed against them by the rapid blows of the beater, will be more easily cleaned of foreign substances, and the fibers less inclined to stick to the bars.

The object of the fan is to distribute the cotton evenly over the perforated surface of the cages after it has been acted on by the beater, and at the same time draw many of the small impurities yet remaining in the stock through the perforations. Upon the speed of the fan depends very largely the uniformity in weight of the lap produced. It is impossible, however, to give a speed which will always produce good results, since this depends entirely on the construction and size of the machine, and the weight of the lap being made. If the fan is run at an excessive speed the cotton is taken too quickly from the action of the beater;

and by not allowing it sufficient time for passing over the grids, many of the impurities which should have been eliminated will pass on to the cages, and tend to stop up the perforations. The clogging of the perforations on the surface of the cage, together with the excessive draft, prevents the cotton from being uniformly distributed on the cage, thus producing an uneven lap. On the other hand, if the draft should be insufficient some of the good cotton will be beaten down through the grid bars into the mote box, and much will not be drawn from the grids in uniform quantities, resulting in thick and thin places in the lap.

The question of split or licking laps is one of vast importance to any mill, since all are more or less annoyed by this difficulty, and if allowed to continue will result in very uneven yarn. As a rule more trouble of this character is experienced in making a light lap than a heavy one. This can be plainly seen by noting that the lap on the breaker and intermediate picker is usually heavier than that of the finisher, and in most cases the lap at the card is the one that gives the trouble in splitting. In almost all cases this trouble can be entirely eliminated by the proper regulation of the speed of the fan, and the adjustment of the draft doors. This trouble may also be caused by the surface of the cages, or the dust chimney being clogged up, and for this reason it is highly important that the cages be taken out, and all the inside parts of the picker be thoroughly cleaned at intervals of every few weeks. In some mills, in order to prevent this trouble, strips of tin or leather about ten inches long are tacked to a slat of wood, and this slat placed across the machine in such a manner that the strips will rest on the surface of the cage, thus preventing so great a draft. With this arrangement it may be thought that an uneven lap would be produced; however it is being done in a great many mills and with apparent good results.

Split laps are also caused by damp weather, or by too much waste (especially waste from the spinning room which has been run through a thread extractor) being in the mixing. In order to produce a good clean and even lap it is very important that the machine is not crowded, since if this is the case there is not time for the leaf and sand to be separated from the stock. Ragged edges of the lap may be prevented or remedied by reducing the width of the lap slightly by means of the contraction plates provided for this purpose. The amount of waste made in the picker room should be closely watched. In some cases quite a lot of good cotton is beat through the grid bars, and is taken out with the motes. This is caused by the grids not being properly adjusted, or the fan running at too low a speed. This defect should be remedied at once, as the stock thus wasted is a net loss to the mill. In order to produce even yarn it is highly important that the laps should be kept uniform in weight, and no lap varying more than one quarter of a pound from the standard should be allowed to go to the card room.



Arrangement of Picking Rooms. Kitson Machine Shop System.

This Shows a Three-Process System of Four Beaters, but with the Breaker Lapper Separated. Opener and Feeder Down Stairs Connected by Inclined Cleaning Trunk to Screen Section Breaker Up Stairs.

COTTON TENDERING DURING GASSING.

It has been found that the presence of magnesium salts in cotton dressings makes the fabric especially liable to be tendered during gassing. The effect is, no doubt, due to the mineral acid set free by the dissociation of the magnesium salt under the influence of the gas flames or hot plates employed in the singeing. The tendering is so serious that it is an open question whether the use of magnesium salts, and especially the chloride, should not be altogether abandoned in the case of goods which have to undergo a subsequent singeing.

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DYEING, BLEACHING AND FINISHING

MERCERISING.

MACHINE USED BY THE BRITISH COTTON AND WOOL DYERS' ASSOCIATION IS AN AMERICAN INVENTION. FIVE IMPORTANT ITEMS TO BE CONSIDERED. YARNS THAT HAVE BEEN DOUBLED AND GASSED ARE BEST FOR MERCERISING.

A typical hank mercerising machine, and one largely used on the continent, is that made by the engineering firm of C. G. Haubold, of Chemnitz. This machine consists of sets of heavy rollers in pairs which are placed vertically over one another, and around which the hanks to be mercerised are placed. The distance between the rollers is regulated until the hanks are stretched; the rollers are then made to revolve, and at the same time a trough containing the caustic soda solution is raised until the revolving hanks pass through the lye.

After the few minutes' impregnation the trough is removed and the cotton washed by spurt pipes. The machine is built with pairs of rollers on both sides so that the shrinking force of the cotton is resisted by the massively made body of the machine. A machine has as many as twelve sets of rollers, and a capacity of from 500 pounds to 1,800 pounds of yarn. An auxiliary roller has been applied to the machine to revolve over the yarn in order to press it against the rollers carrying the yarn and thus squeeze out the excess of caustic soda and at the same time to assist penetration.

The machine used by the British Cotton and Wool Dyers' Association is of the same type as the Haubold and is of American invention. Instead of the stretching rollers revolving about stationary centers as in the case of the Haubold machine they describe endless paths, and only part of the time do they carry the hanks of cotton.

In mercerising, the following items have to be considered: (1) The cost of boiling-out before mercerising, (2) The initial cost of the mercerising machine and of repair, (3) The cost of labor, (4) The cost of the caustic soda used, and (5) The output. As far as the luster produced is concerned it may be stated that all machines which keep the cotton stretched and secure even penetration give the same luster. By mercerising cotton tightly stretched over iron supports as good a luster can be produced as with any machine.

Mercerising machines are designed with the five points mentioned above in view. Item 2 seems rather heavy in the case of the American machine, but this must, of course, be considered together with items 3, 4, and 5. The labor cost is small, as the machine only requires men at each end to don and doff the hanks. The amount of caustic soda solution required is comparatively small, and the output of the machine is large. It is however, only adapted for large businesses; few works could hope to keep such a machine constantly running. If run only intermittently the machine is obviously less economical.

For small lots other machines are more adaptable. The Spencer machine is used largely and successfully in England. Bemberg's, of Barmen, make a hank-mercerising machine which is similar in principle to the Haubold but is not so massive.

Some works, both in England and in America, claim that they have mercerising machines which are far better than those which have been hitherto made public, and these machines they are not disposed to place on view. It may be that they have different means of overcoming mechanical difficulties, but the advantages of these machines are probably exaggerated. The writer visited one American works where they had a machine which they refused to show; it was said that they had also a special machine for dyeing with sulphur colors which they similarly guarded; but with the mobility of labor which at present exists in America it is probable that these "secrets" will soon become common property.

It is found that yarns which have been doubled and gassed are the best for mercerising. Single yarns are not sufficiently strong and are liable to untwist during the mercerising operations. Long staple cotton is the best for lustring purposes and this stipulation confines the choice of cotton to Egyptian and sea island. Bleaching is generally performed after mercerising as cotton mercerised after bleaching is generally harsh. The effect of mercerising cotton is to increase its strength and its capability of being stretched, as shown by the following figures given by Friedlander.

		Strength in grms.	Extension in m.m
Ordinary yarn	1	360	20
	2	356	20
	3	360	22
Yarn mer. at 35 deg. B.	1	530	44
	2	570	40
	3	559	35

Yarn is hydro-extracted before being entered into the caustic soda solution or dilution of the lye results.

The mercerising of cotton warps is still performed in the warp slasher, tension being produced by having consecutive rollers revolving at slightly increasing speeds as the warps pass through. Fine counts of yarn are still difficult to mercerise and this fact has led to attempts to mercerise loose cotton and sliver; this subject is engaging the attention of many inventors and improvements are expected.

In the Mather and Platt stenter merceriser the wash water from the first set of pipes is used for washing the cloth over the second tank. After being used in this way the water contains a considerable quantity of caustic soda and is used in the bleach-house. This method of washing is also used in the Gruschwitz and many other machines, and is called washing by counter currents. It may be understood as a current of clean water meeting a current of caustic soda and mixing with it. The cloth, which contains the caustic soda, finally emerges through pure water, whereas the wash water takes up more and more soda as it progresses until it is of sufficient strength to be used for other purposes. The aim is to use as little water as possible, or rather to use it as effectively as possible.

In many cases it is not desirable to use the wash liquor in the bleach-house and the superfluous water is often driven off by evaporation and the caustic soda again used

for mercerising. The whole of the wash waters are not, however, used. Experiment has shown that most of the caustic soda is washed out of the cloth during the first washing or with two washings according to the type of machine used. Thus in the Schwabe piece mercerising machine where the washing is very thorough, the first two wash waters are evaporated, and the third and fourth used in the bleach-house. The caustic soda solution obtained after the third and fourth washing is too dilute to evaporate economically, but by the procedure mentioned it is seen that little caustic soda is wasted. The wash waters are analysed from time to time. Hot water and even direct steam are sometimes used for washing after mercerising, and in this case special effects are obtained. There is not so much swelling of the fibers as when cold water is used; the threads occupy less space; and the material is usually harsh in feel.—*S. H. Higgins, in Dyer and Calico Printer.*

KNITTING

PRODUCING A FABRIC WITH AN OPEN MESH.

The devices herewith illustrated are applicable to that class of knitting machines known as spring-needle machines. The particular functions of them relate to the transfer of a stitch from one needle to another, or other like operation, whereby is produced a fabric of open mesh.

In the drawings Figure 1 is a plan view indicating in a general way the cylinder and some of the parts of an ordinary spring-needle machine, together with the several parts of the devices. Fig. 2, is an enlarged view of dividing and landing wheels.

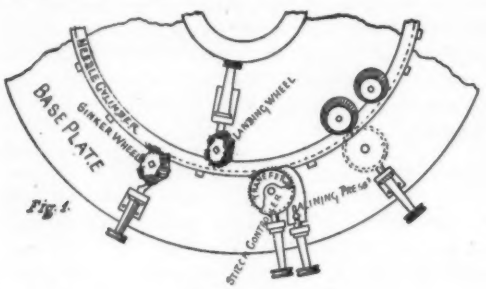


Fig. 1.

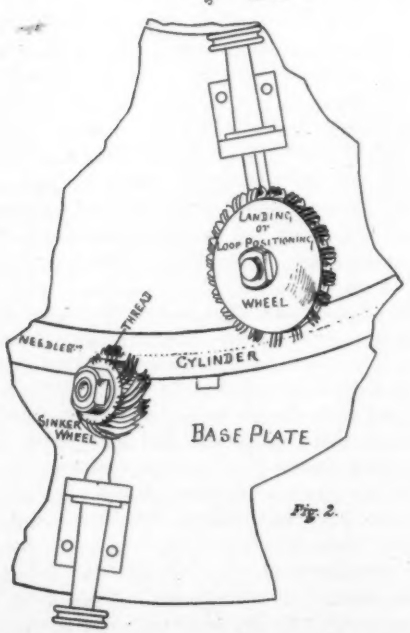


Fig. 2.

In the revolution of the cylinder (which is supposed to be in a left hand turn, the part shown in Fig. 1, passing to the right) the needles, when they come to one feed, have on their shanks the stitches supplied at the former feed and its co-operating parts. At the second of the two feeds the needles receive additional loops and it is assumed that certain of the loops there received are to be transferred from one needle to another, to cause the peculiarity of fabric. It is very important that these loops shall be of sufficient length to permit this without undue strain or breaking of thread or needle and without causing an irregular or uneven appearance in the cloth. For this purpose a dividing or sinker wheel is provided, similar to the ordinary wheel but having straight blades, arranged in series so as to press the yarn or thread in three successive long loops between four successive needles, as shown in Fig. 1, leaving two needles with long loops thereon.

Ordinarily the loops already on the needle shank will be brought up into the needle hooks by the ordinary means, but, as the loops just made are longer than usual, there is provided a landing or loop-positioning wheel to meet such unusual conditions, having blades grouped like those in the sinker or dividing wheel and made large enough to raise the old stitches the proper distance on the new and longer ones. The blades of this wheel being large enough to raise or land the long stitches, it is found that they also raise or land the short stitches between the groups of long ones and that no blade is necessary between the groups of large blades. The terms applied to this wheel are those of convenience, since it is not strictly a landing wheel, but lifts the irregularly divided yarn a distance which is necessary in this peculiar construction.

The revolution of the cylinder then brings the needles to the devices provided for transferring the stitch or loop, the stitches being arranged as two long and two short, alternating pairs. These devices comprise a transfer wheel, a stitch controller and an aligning presser or needle controller co-operating therewith.

The style of the fabric may be varied according to the number of needles on which long loops are to be placed and which are to be grouped in the transfer wheel and from one or more of which loops are subsequently to be cast off: also depending on the number of needles between the set or series on which long loops are placed.

It has just been announced in the French newspapers that on the recommendation of M. Pichon, minister of foreign affairs, M. Fallieres, president of the French republic, has, in connection with the fifth International Cotton Congress recently held in Paris, conferred the distinction of Chevalier de la Legion d'Honneur upon C. W. Macara, chairman of the committee of the International Federation of Master Cotton Spinners' and Manufacturers' Association, in recognition of his great services to the cotton industry of the world.

MARKET REPORTS

KNIT GOODS MARKET.

The tone of the knit goods market corresponds with that of yarns, and what applies to one applies to the other so far as demand and supply are concerned.

In some quarters a little better feeling is noticeable and some early orders for spring delivery have been placed, but not enough to stimulate the market into what can be denominated as even moderate activity. The demand has been somewhat spotted for both the better and poorer classes of goods, both of underwear and hosiery. The market has been characterized not so much by the size of the purchases, as by what has been exhibited of getting certain lines of make on account of the reputation of the goods for excellence or on account of unusually low values. If there is to be any kind of a spring trade or any demand for consumption, many more orders will have to be placed before many months. By the wavering on the part of buyers to place orders, and their preference to take chances on the market there is little to warrant the anticipation of wants on the part of manufacturers. Buyers have an idea that they will be able to secure goods at much less prices, as will certainly be the case should the crop be a large one, as is now indicated. Salesmen that have been out on the road are generally returning with diversified accounts of the retail and jobbing trades, and many firms have determined not to send out any of their men again until they can see some signs of doing business, at least enough to pay the traveling expenses of their salesmen. The consequence of all this is that manufacturers and their agents have assumed a waiting position and show little inclination to reach out for trade if it involves any traveling expenses of moment. Orders that are now being placed are almost invariably for quick delivery, and much to the surprise of the prospective purchaser some of the goods wanted have been found out of stock and cannot be supplied at once. This shows a scarcity of merchandise in certain lines, and that there is not a great variety of goods to be had. This applies more to fancy styles than to the regular make of fabrics.

The cheap grades of underwear are being bought chiefly in the Balbriggan lines while the better grades are being left until the last. The better grades of standard goods are mostly bought for the Western section of the country, where business is reported to be in a better condition.

COTTON YARN MARKET.

August is usually a dull month in the yarn market, but this year it has been exceptionally so and when sales are made they are almost universally in small lots for immediate or nearby need.

The consumers are running very light, and the mills have been accumulating stock, some of which is in the hands of commission men, on which advances are being made and they are forcing delivery. A number of the mills have signified their intention to start on September 1st, and if they do they are simply going to delay the date on which prices can be obtained which will let the mill out whole or show a profit, and it would be much better for all the mills in the South to continue shut down until they can get a profit on their goods. It would also help conditions materially if the mills who have stock on hand instruct their agents to hold at certain prices, and stop this cutting down prices. Yarns have been forced on unwilling buyers with the inevitable result that yarns have been sold at a ridiculous figure, and if yarns had been held at two cents per pound higher the volume of business done would have been as heavy. There has been a slight improvement in trade, just slight enough to know that things are no worse, but the demand has been very limited and is only about 50 per cent. of last season.

Prices vary considerably according to the reputation of the mill, the quality of the spinning, and to the length of the staple used.

Most any quotation may be considered normal to-day, and this should be clearly understood by our readers when they consult our list of quotations. For instance, we are informed by a commission yarn firm that sold the other day for a Southern mill, two-ply warp yarn No. 30 at 22 cents per pound for quick delivery with the knowledge that the same counts of yarn could be bought from the general stock at 19 to 20 cents per pound, the difference in the price being due to the character of the manufacture.

It appears that the price of cotton is having little or no effect on the price of yarn or goods.

Every firm that has been consulted reports a considerable amount of yarn on hand, in skein, warp and on cones, both Southern and Eastern manufacture, all of which is available for prompt delivery. But so far as we can ascertain, the greater part of the Southern yarn that is offered in the market has been placed on consignment, and spinners are anxious to convert their property into money, and in many instances are willing to accept prices that would have been entirely out of consideration a month or two ago. This condition is due more to this need of spinners for money than to any over stock of goods.

We quote as follows:

SOUTHERN SINGLE SKEINS.

4s to 8s	14 @14½	22s	18 @18½
10s to 12s	14½@15	26s	19
14s to 16s	15½@16½	30s	20
20s	17 @17½		

SOUTHERN TWO-PLY SKEINS.

4s to 8s	15	30s	19½@20
10s to 12s	15½@16	36s	22½
14s	16	40s	23 @24
16s	16	50s	30 @31
20s	17 @17½	60s	38
24s	18 @18½	3-ply 8s upholstery	16½
26s	18 @18½	4-ply 9s upholstery	16½

SOUTHERN SINGLE WARPS.

8s to 10s	16	22s	17½@18
12s	16 @16½	26s	19½
14s	16½	30s	20
16s	17	40s	26
20s	17 @17½		

SOUTHERN TWO-PLY WARPS, ETC.

8s to 10s	15½@16	26s	19
12s to 14s	16½	30s	19 @20
16s	17 @17½	40s	25
20s	17 @17½	50s	32
24s	19		

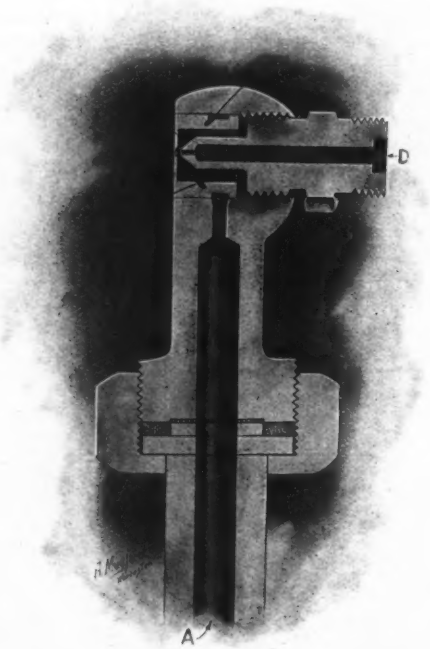
SOUTHERN FRAME PEELER CONES.

8s	16½@16¾	20s	17¼@17½
10s	16½	22s	17½
11s	16½	24s	18
12s	16¾	26s	18½
14s	17	30s	19 @19½
16s	17	40s	19½
18s	17¼		

NEW MACHINERY AND TRADE NOTES.

THE TURBO-HUMIDIFIER.

We herewith illustrate what is known as the turbo-humidifier, sold by The G. M. Parks Company, Fitchburg, Mass. This invention relates to an apparatus for imparting additional humidity or moisture to the air in a factory or other buildings where it is often desirable to increase the natural humidity of the air. This invention has for its objects the production of a highly efficient but very simple humidifying apparatus, readily and quickly adjustable, of relatively small cost for installation and maintenance, and which, by a very slight change, can be used equally well with either air under pressure or steam according to the season of the year and the convenience of the user. The water is not under pressure and the amount used may be regulated at one point for the system in a room or group of rooms, or by means of suitable valves controlling the individual nozzles or vaporizers, and in the latter case, the initial adjustment of the nozzle members would not be disturbed.



The device works as follows: Air or steam is supplied at about sixty-five pounds pressure at the orifice *A*. It will be seen that this air passes through the tangential orifices in the bushing, *B B;* produces a vacuum at the end of the water nozzle *E*, and by so doing, draws water through the tube *D*.

The centrifugal motion imparted to the air by this principle, actually pulverizes the water in the chamber *C* before it is delivered to the atmosphere. Again the importance of this centrifugal action is noted when the vapor is delivered to the atmosphere, since it spreads the vapor and distributes it before condensation can occur. In other words, it "balloons the jet."

A description of a complete system is something like this: Steam or air at sixty to sixty-five pounds pressure is supplied through a main pipe to the several branch lines in which the heads are located. Parallel with these branch steam or air lines are the water branch lines, which run dead level. Water is supplied through a covered, float-controlled tank. This tank is equipped with overflow pipe, draw off pipe, sponge strainer, etc., and is covered to keep out dust and lint. The tank may be practically the same as that furnished with any complete toilet room set. Its size is not disadvantageous. One of these tanks will supply from forty to fifty heads, but in large rooms the best practice is to divide the system into two, three or four separate sections. The tanks may be located in toilet rooms, or other convenient, accessible places. The high and low water lines of the system are determined by the overflow and float valve in the tank. The high water line, controlled by the overflow pipe, is located about two inches below the center line of the head, so that it is absolutely impossible for water to overflow from the heads on floors, machinery, stock, etc.

A LINEAL COUNTER.

We illustrate herewith a device manufactured by The C. J. Root Co., Bristol, Conn., for measuring, by the yard or foot, cloth, thread, ribbon, tape, wall paper, opaque,

etc., in all processes of manufacture. This company is ready to adapt its counters to any conditions for measuring in the mill. The Cocheco Manufacturing Company, Dover, N. H., has introduced this device in its weave shop for counting the number of picks made by a loom. The Sayles Bleacheries, Saylesville, R. I., have introduced it into their works.

THE NEW BEDFORD TEXTILE SCHOOL, New Bedford, Mass. We are in receipt of a catalogue of this school for 1908-1909. The fall term of this school for day students begins September 21st and ends January 29th, 1909. The spring term begins for day students February 1st and ends with the school year, June 18th. The object of this institute is the teaching of textile technology with special regard to the manufacture of cotton and subjects allied thereto. Those intending to take a course of instruction in cotton manufacturing will do well to write to this school for its catalogue.

STANDARD CRAYON MANUFACTURING CO., Danvers, Mass. This company manufactures crayons for all purposes for which crayons are used, in white and colors. These are well adapted for mill, lecture and railway purposes, also for use by lumbermen, and are of special utility in textile factories.

NEW ENGLAND COTTON MILL INDUSTRY

MORE ACTIVITY AMONG FALL RIVER MILLS. CURTAILMENT IN PRINT CLOTH PRODUCTION. CONDITIONS IMPROVING IN RHODE ISLAND. MILL OPERATIONS AFFECTED BY WATER SHORTAGE.

SPECIAL TO "COTTON."

In spite of the conditions which have affected business in the eastern section of the country, the New England cotton mill industry has been singularly fortunate. While it has been necessary in some places to restrict production by curtailment and shut downs, those methods have not been general, for in other localities the manufacturing plants have been running on full time, and in some instances on over-time and at night. The scarcity of water, due to the long drought of the summer, has been a serious affliction to some enterprises, but there are other hindrances that have occasioned the closing of factories or reducing the running time. Over-production has prompted different methods for some plants, but as the season comes on, the expectation is for a renewal of work on usual time. The different branches of the industries are in good condition, and only a return of the commercial activity is required to restore normal conditions.

MASSACHUSETTS.

Mills in Fall River are showing more activity. The Pocasset Manufacturing Co. is building a new flume of cement to take the place of the wooden one hitherto in use. The Davis Mills have placed contracts for looms, shafting, and carding and spinning machinery for their new mill. The Seaconnet Mills have been considering an enlargement if it can be accomplished at an expense not to exceed $100,000. The proposed plan includes the enlargement of the buildings and the installation of about 10,000 new spindles, but inasmuch as the mills are reported to have 5,000 spindles idle because the carding machinery can not keep up with the present outfit, the directors have not been united in the plan to enlarge, which means the borrowing of more money. The Kerr Thread Co. has been making improvements, by rearranging the machinery in a more systematic manner, and by the introduction of new cards, pickers, speeders, spinning-frames, and high-speed combers. Two 1500-horse-power turbines have been installed, and the power plant altered from steam to electric. The new Lincoln Mill has started in a gradual way. All the machinery is in place, but the plant will be used according to the amount of work received. The mill is equipped for the production of fine goods. Charles B. Chase is superintendent and Benjamin B. Read, Jr., is treasurer. The first dividend of the Luther Manufacturing Co. has been paid this summer. The mill was organized in 1903, taking over the plant of the old Robeson Mills, and the capital is $350,000. Large improvements were necessary, and a debt of $379,000 was accumulated, but Charles B. Luther the treasurer was backing the enterprise himself, in spite of the fact that he was not an experienced cotton manufacturer, and through his determined methods and courage, the enterprise has been made to pay. The debt has been reduced steadily, till 1st of October it was cut down to $131,000. The plant now has 51,600 spindles which on the capitalization makes the cost about $7 a spindle, and the net debt is less than $100,000. The dividend was one and one-half per cent. and was payable on August first. It is reported that stock has been subscribed and the land selected for a large blanket mill to be erected during the year. The capitalization is set at $500,000 and the stockholders include Lieut. Gov. E. S. Draper, Senator W. M. Crane, and Mr. Haffenuffer of Fall River, each of whom takes $100,000 of the new stock, and the remainder by a dry-goods syndicate and interests allied with it. A good location has been secured, and a market for the output promised. The American Printing Co. is increasing its steam plant by the addition of ten more boilers to the twenty already in use. This necessitates the building of another chimney to be 175 feet high. The new boilers will produce steam for two new electrical engines, which are best adapted to supply the power to the plant which is somewhat scattered. The Parker Mills have recently paid a dividend of $12,000 to its stockholders on a capital of $800,000 which is equal to one and one-half per cent. The present indebtedness of the company is $237,726, but it is being reduced constantly. The Bourne Mills have paid a quarterly dividend of one per cent.

There has been extensive curtailment among the print cloth mills in Fall River during August; some mills have been closed for a week at a time, and other have shortened the week by a day or two, some have stopped their looms and other parts of the machinery. Mill stocks have been very quiet during the month, and no improvement is expected so long as the depression continues.

In New Bedford, the Dartmouth Manufacturing Co. is preparing to build a one-story brick and concrete building to be used as additional quarters for the picker mill. The dimensions are to be 137 by 63 feet and 16 feet high. The Gosnold Mills have installed a new ventilating system in the spinning rooms. The City Manufacturing Co. has declared a dividend of one and one-half per cent. on the earnings of the present year, and the same amount from the undisturbed earnings of last year.

The Lawrence Manufacturing Co., Lowell, is running on full time with plenty of orders on hand. The Merrimac Manufacturing Co. has passed the semi-annual dividend. Last February it paid a half-yearly dividend of 2 per cent., and a similar amount a year ago. This year the business has been so affected that the directors were obliged to take this action. The mill has 170,000 spindles, 5,028 looms and 22 printing machines, and produces printed cotton cloths, corduroy and fancy white goods.

The Greylock Mills, North Adams, at their recent annual meeting, elected as directors, Wellington Smith of Lee, William B. Plunkett, Charles T. Plunkett, W. Caldwell Plunkett, and Z. B. Hall of Adams. The officers elected were, Wellington Smith, president; C. T. Plunkett, vice-president; W. B. Plunkett, treasurer; W. C. Plunkett,

agent. The corporation has recently filed the necessary papers declaring that the $100,000 increase of capital voted in 1895 is fully paid in.

The Otis Company at Ware has closed its mills for two weeks during August. About 2,000 persons are affected by the shut-down.

Fully 330,000 yards of khaki cotton duck is being finished by the Springdale Finishing Co., Canton, Mass.

The plant of the John C. Meyer & Co. is to be removed from Boston to Lowell, where it will occupy the building formerly occupied by the Pickering Manfg. Co. The plant employs about 200 persons, but in its new quarters will require more. The firm is engaged in the spool-cotton converting business, dyeing and finishing, buying its product in the rough and finishing and dyeing it to order.

At the meetings of the directors of the several Bliss-Fabyan mills the following were elected to the places vacated by the death of Orlando H. Alford: Otis Co., F. W. Fabyan; Columbian Manufacturing Co., Isaiah R. Clark; Thorndike Co., George Fabyan; Cordis Mills, Edward B. Alford; Boston Duck Co., Philip Y. DeNormandie.

The new power house of the Pacific Mills, Lawrence, which has been in process of construction for almost two years, is now completed and one part is in operation. The plant consists of three turbines, which will supply power to both the upper and lower Pacific Mills. Large cement coal-pockets have also been completed for the plant.

Two new water-wheels of 300 horse-power have been put in position in the plant of the Fisher Manufacturing Co., Fisherville, and when in operation will do the work recently carried by the wheel in the new weave shop.

CONNECTICUT.

Work on the new plant of the Ninigret Mills Co., Mystic, has been fast going, and the plant will be completed some time this month. The company has organized with a capital of $100,000 for the purpose of manufacturing silk and cotton goods. The incorporators are: Otho O'Sullivan, Stonington; George W. Mansfield, Westerly, R. I.; A. T. L. Ledwridge, Westerly; Dwight C. Stone, Stonington; Eli Gledhill, Mystic, and Rowland N. Mackay, Readville, Mass.

The Uncasville Manufacturing Co.'s mills which were closed on account of a break in the machinery are again in operation.

Work is progressing on the two-story addition to the mill of the Danielson Cotton Co., at Danielson. This building is to be 150 by 200 feet area, and will contain 200 fancy looms on the second floor; the first floor being used for a carding department.

MAINE.

A new enterprise is to be established at Topsham, Maine, by Dr. H. Q. Mariner of Topsham and C. B. Maxfield of Lowell, Mass., to be known as the Maxmarlan Knitting Mill, for the manufacture of men's hosiery. A building has been leased and equipped with machinery, which will require the employment of about 30 persons at the start.

At the annual meeting of the stockholders of the Lockwood Co., Waterville, a semi-annual dividend of three per cent. was declared.

RHODE ISLAND.

Conditions among the manufacturing plants of Rhode Island are improving, and the summer is closing with affairs in generally better condition than was anticipated. The work has generally been continuous, shut-downs being few, and curtailment light. In the Blackstone valley the Blackstone hosiery mills at Central Falls took advantage of the vacation period to close during the month of August, when the majority of the employees take vacations each year. The Royal Mills at Riverpoint in spite of an accident to their plant, have kept up to normal production by running nights.

The United States Cotton Co., Pawtucket, has reduced wages on a general basis. About 500 persons are concerned.

The Rhode Island Processing Co., Coventry, has installed a new turbine water-wheel and a large fire-pump. It is expected that the cost of coal will be reduced about 50 per cent.

The A. A. A. Spooling and Winding Co., Auburn, has recently increased its equipment, and contemplates adding several tape looms in the near future. Full time has been required, and at times night work has been necessary.

Other factories in the Pautuxet valley have enjoyed a normal summer's work.

In Woonsocket the Hamlet Textile Co. has made extensive improvements. Two new weave rooms have been equipped, over 100 new looms for weaving silk, and new silk-warping machines having been put in. Additions have been made to the power plant. The mill is manufacturing cotton-back satins, taffetas, peau de cygne, etc. The Lawton Spinning Co. has completed and put into service a new finishing-room. More help is being employed, and it is expected by the middle of the month that the mill will be in full capacity with 400 persons engaged. The E. K. Ray estate has been building an addition to its cotton-waste store-house, 60 by 60 feet area and two stories high.

The Valley Falls Company is building an addition to its mill at Albion, five stories high and 100 by 75 feet area. Home labor is being employed, thus giving work to idle persons in the place.

From August 28 to September 8 the mill of J. & P. Coats, Pawtucket, has been closed, which is the second shut-down during this season. About 2500 persons are affected.

NEW HAMPSHIRE.

At a meeting of the stockholders of the Cocheco Manufacturing Co., Dover, N. H., it was voted to reduce the par value of stock from $500 to $100, on the condition that each stockholder receives five of the new shares, valued at $100 each in exchange for the former shares. Hamilton DeForest Lockwood, Boston, has been elected treasurer of the company to take the place of Arthur B. Silsbee, resigned. Owing to a water-shortage, No. 2 Mill has been shut down for some time.

The dry weather of August seriously affected the mills at Nashua, compelling the Nashua Manufacturing Co., and the Jackson Co. to use steam power. The water at the Mine Falls dam was 41 inches below the level of the dam, which was lower than ever previously known.

The annual meeting of the Salmon Falls Manufacturing

Co. at which the report of the treasurer was presented for the year ending May 31, showed the establishment to be in a satisfactory condition. The net profits for the year were $79,043. New carding and spinning machinery has been purchased, and the purchase of new looms was authorized, the installation to be made at once. Two dividends of $6 a share have been paid during the year.

After considerable litigation the Amoskeag Manufacturing Co., Manchester, has purchased from the Spaulding-Jone interests the rights in the land and water power which has been a source of contention for some time. What disposition will be made of the property acquired is not made known by the Amoskeag Co.

NEW ENGLAND MILL SITUATION.

INDICATIONS OF MATERIAL IMPROVEMENT. PRICE OF MACHINERY OFF 10 TO 25 PER CENT. FROM LAST YEAR'S FIGURES.

By Special Correspondent.

During the past month there have been developments in the economic situation of the cotton industry in New England that are strongly indicative of a material improvement in the market for both raw materials and finished goods. Events of a disquieting nature that have been hanging over the industry for many months have been removed, and there is a general feeling among the more conservative textile interests that there will be a better market for goods within the next four weeks.

The auction sales of napped goods for the Nashua mills and the Arlington sale have removed an accumulation of fabrics that has caused the trade a great deal of anxiety. While it is claimed that the sale of the Nashua goods was merely to re-establish trademarks, the real facts of the case are that there was a heavy accumulation of napped fabrics that had to be moved and a sacrifice of from 10 to 60 per cent. was far more desirable than interest carrying charges. It is understood that the Nashua mills are going to ease up on certain lines of napped fabrics until conditions are materially changed.

The general market for cotton fabrics is limited to drills and wide sheetings which appear to be well taken, although at low prices. There is no buying of fabrics for the Oriental trade and our exports to South America for the past month have been at a low point and confined to lightweight drills and colored cotton goods.

The market for yarns continues in an apathetic condition and prices soft. The break in the price of cotton on the New York Exchange encourages spinners to believe that yarns will go slightly lower and then become firm, after weavers have covered their contracts, because of the operations of the law of supply and demand. Manufacturers of plush, carpets and men's wear are bidding under the market for yarns and are taking a few lots at their own prices, so yarn mills report.

Textile machine makers report quite an improvement in their market during the past few weeks and note a tendency on the part of careful mill men to purchase new machinery at prevailing prices, which are from 10 to 25 per cent. lower than one year ago. The Draper Company is receiving quite a number of new orders from local mills that are making extensions to their plants. Orders that were placed a year ago, and held up on delivery when the panic came, are now being ordered out.

The last two weeks in August and the first week in September will be a general period of curtailment in New England. Fall River is running at a very low point and some of the larger mills, such as Amoskeag, Everett, and Lancaster are closed down for two to three weeks vacation. This curtailment will have a splendid influence sentimentally and actually, since it will bring the trade face to face with the problem of bare shelves and no production. Not only will the curtailment have a good effect on the trade but it will stimulate labor, when the mills start up again, to a higher efficiency.

This month has been a month of correction, so to speak. Surplus goods have been marketed, curtailment put into effect and raw cotton reduced to a more favorable price from the standpoint of the consumer.

There have been a few sales of the standard textile securities this month, but in every case, with one exception, there have been advances scored in the market prices. Amoskeag, which has recently reduced its dividend, actually advanced from a previous quotation made when the stock was paying nearly double the dividend that it is now. Other prime cotton mill stocks have held firm with a tendency to advance, except Dwight, which has dropped over one hundred points from its last quotation, $1,150. The drop is due to the selling under pressure and not to any adverse news affecting the mill property. There are few shares in the hands of brokers and the outlook is for higher prices for cotton stocks.

MILL NEWS.

Notices of mill projects, additions or improvements are solicited for this department.

ALABAMA.

FORT PAYNE. The Florence Hosiery Mills, branch of the Davis Hosiery Mills of Chattanooga, Tenn., will add fifty knitting machines and other equipment.

OXFORD. The Planters Mfg. Company whose product is sash cords, etc., has increased its capital from $100,000 to $165,000 and will operate 3,500 spindles, 200 braiders, etc.

ARKANSAS.

MALVERN. J. A. McMahon of the Nashville Woolen Mills, Nashville, Ark., is said to have in contemplation the establishment of a woolen mill at this place.

FLORIDA.

JENNINGS. The water power at this place is being developed with the idea of establishing an electrical plant for the transmission of power to operate a mill to manufacture cotton thread and similar products. We understand that there has been no definite arrangements made. W. E. Privett can give information.

GEORGIA.

AUGUSTA. Frank E. Baldwin, Journal Building, Boston, Mass. has interested the Chamber of Commerce of this place in a scheme for the building of a cotton mill at this place, or vicinity. Regarding this matter Mr. Baldwin informs us that he has taken up the work of locating cotton mills in the South and to this end has sent a

circular letter to the various boards of trade in a large number of places asking information, and among them he has interested the one at this place. Mr. Baldwin expects that in time things will work out, but at present there is nothing to say.

CALHOUN. The Echota Cotton Mills are putting a main mill building of 10,000 spindles and 300 looms for the manufacture of print cloth. These mills will have steam power of 500 or 600 horse power, electric lighting equipment, etc. T. W. Harbin of this place is president and can furnish information.

COLUMBUS. The dye house of the Eagle & Phenix Mills is being repiped and new heaters installed, and the old smoke stack built some forty years ago will be extended to the height of the new one just completed. These mills are planning for a busy season.

HAMPTON. The Hampton Cotton Mills will increase their capital from $100,000 to $150,000 and enlarge their plant, and an addition will be made to the main mill building 75x250 feet, to install 4000 spindles with accompanying carding, picking and winding machinery. Steam power will be used, but the present power plant is sufficient for the enlargement. John Hill, Prudential Building, Atlanta, Ga., is the engineer in charge.

KENTUCKY.

LOUISVILLE. The Commercial Club of this place is interested in a proposition for the establishment of a worsted yarn mill.

LOUISVILLE. Thomas Williams will organize a company to establish a worsted yarn mill in this place, with 3,500 spindles and accompanying machinery.

LOUISIANA.

NEW ORLEANS. A plan is proposed for the organization of a company to manufacture cotton goods, to be capitalized at $250,000. The mill will be operated by electricity and will contain 15,000 spindles.

WINNFIELD. The Winnfield Progressive League is negotiating for the location of a cotton mill in this place.

MASSACHUSETTS.

AMHERST. The Brown Mercerising Company has been organized under the direction of Calvin Coolidge of Northampton who has applied for articles of incorporation. The business of mercerising cotton yarns now being conducted by J. E. Brown in Holyoke will be transferred to this place. Stock amounting to $50,000 will be secured of which $25,000 guaranteed preferred will be placed on the market. E. D. Marsh of this place can give further information.

WARE. Geo. H. Gilbert Mfg. Co., has completed its new 64x58 addition to its No. 4 mill and expects to build another addition next spring.

NORTH CAROLINA.

EAST DURHAM. The Durham Cotton Mfg. Co., is making improvements to its plant to cost about $50,000. It has installed new finishing machinery and will take out the boilers and engines and install electric generators and motors to drive the carding, spinning, dyeing and finishing machinery.

KINSTON. The Orion Knitting Mills have increased their capital from $50,000 to $100,000 and will install new machinery and equipment.

LINCOLNTON. The Eureka Mfg. Company has completed its building and has installed 1,020 mule spindles and accompanying equipment for the manufacture of yarns. J. L. Lineberger is president.

MARION. The Mt. Ida Hosiery Mills have been incorporated with a capital of $25,000 by R. L. Greenlee and others.

MARION. The Marion Knitting Mills have been incorporated with a capital of $100,000. W. W. Neal or J. Yancey can furnish information.

MT. HOLLY. The Albion Cotton Mills Co. has been incorporated with a capital of $100,000 in which A. P. Rhyne and others are interested. It should be said that this mill is an established plant and has the same ownership as the Mt. Holly Cotton Mills. These two mills together have 5,250 spindles for the manufacture of yarns.

TROY. The dam across Little River, five miles from this place, has been built to develop power for the transmission of electricity to operate the Smitherman Cotton Mills which now have 5,000 spindles and 216 looms for the manufacture of skirtings, domets, etc. The dam will be 22 feet high and will give a 40-foot head, developing 1000 to 2000 horse power. Mr. Smitherman and associates will build another cotton mill next year.

SHELBY. The Shelby Cotton Mills will build an addition to their present plant and will install 6,500 producing spindles.

RALEIGH. The Caraleigh Mills Company is to install an equipment for an electrical transmission of power, but we understand that it has not yet purchased the necessary machinery. This company has 10,816 spindles and 436 looms.

RALEIGH. The Pilot Cotton Mills Co. is to install electrical machinery for operating its 8,000 ring spindles and 325 looms. This mill manufactures colored shirting and chambrays.

RALEIGH. The Raleigh Cotton Mills operating 15,000 mule spindles on hosiery yarns will install a combination of the group system and individual drive of electrical power for their machinery.

RALEIGH. The Martin Hosiery Company will, it is said, install electrical machinery to drive its machine equipment.

ZEBULON. It is proposed to organize a company with a capital of $100,000 to erect next year a mill in this location for spinning hosiery yarn and possibly for weaving sheeting. Archibald Meldrum can furnish information.

NEW JERSEY.

PATERSON. A contract has just been awarded by Harry E. Danner to Frank B. Gilbreth, general contractor, New York, for a cotton mill to be erected at this place at a cost of $100,000. The construction is to begin immediately.

NEW YORK.

HAMILTON. The Hamilton Hosiery Mills have been incorporated with a capital of $30,000 to manufacture hosiery, underwear, etc. W. and F. E. Nugent and others of this place are interested.

OKLAHOMA.

ARDMORE. It is stated that the Commercial Club of this place has closed a contract for the location of a cotton mill by New England capitalists.

EL RENO. The Canadian Cotton Mill Company to be located in this place has been incorporated with a capital of $50,000 by Frank E. Gillette of this place and others.